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JOURNAL OF SCIENCE.

MAY, 1883.

I. FLANK ATTACKS ON EVOLUTION.*

MR. RUSKIN'S noted treatise on the management of sheepfolds is not the only work bearing a title which throws no light upon the nature of the contents or the purposes of the author. The two essays before us might indeed have legitimately claimed our attention, but we should have little suspected at first sight that both of them are attempts to obtain a reversal of the great intellectual reformation of the nineteenth century.

The distinctions between crystals and organisms are, no less than their mutual analogies, a fair subject for investigation. But we scarcely see that Mr. Howard has thrown any new light upon this interesting question. It has long been known that crystals consist of a multitude of particles similar in shape, in structure, and in composition to the whole which they constitute. It is admitted that a crystal, though it may grow, is incapable of true ingestion and excretion; that it does not propagate its species, and that it has no vital cycle. There is indeed in the crystal, as in the organism, individuation; a certain portion of matter, more or less complex, is marked off from all around it. It may further be contended that a crystal can grow under suitable circumstances, and that if damaged it possesses a self-reparative or restorative power. We may also be told that the distinction between growth and reproduction is not so capital as was once supposed; and again, that there are animals

* The Contrast between Crystallisation and Life. By J. E. HOWARD, F.R.S., F.L.S., F.R.M.S., &c. London: E. Stanford.

Le Nouveau Programme de l'Enseignment Secondaire. Par M. H. DE CASAMAJOR. (*Les Mondes*, March 4, 1883.)

having no definite vital cycle, which are not born, and which do not of necessity die.* It may likewise be shown that in lowly animal forms there occur structures not curvilinear in their outlines, but reminding us of the geometrical forms of crystals. It is also indisputable that in the diamond, a crystal formed of carbon,—the characteristic organic element,—curvature is at least foreshadowed. Still, granting all these approximations, or rather perhaps analogies, there is a gap between life and crystallisation not easily to be filled up. We can take amorphous, shapeless matter, quite devoid of individuality, and by very simple manipulations we can cause it to crystallise in forms differing according to its chemical nature. But so far, it must be frankly conceded, we have been unable to start life afresh. We must have the ovum, the seed, the spore as an initial-point. We cannot take animal or vegetable matter, as obtained from dead animals or plants, and from it construct even the humblest living organism. Still less can we vivify inorganic matter. And unless we can perform this latter exploit, all the experiments of a Pouchet or a Bastian, even if free from the slightest loophole for error, are, *ex hypothesi*, beside the real question.

But admitting all this, provisionally at least, we have to ask whether the contrast between crystallisation and life has the signification which Mr. Howard and his friends seem to find in it, and whether it can be accepted as an argument of any weight against the truth of Evolution?

It may well be questioned whether any upholder of the doctrine of Development regards crystals as a stepping-stone —much less a bridge—between dead, unindividualised matter and the plant or the animal, or assumes organisms as having arisen from crystals. Lorenz Oken, more than forty years ago, taught that the crystal sprang from the fluid drop by a process of contraction, flattening down, whilst the organism took its departure by the opposite process of expansion. Translated into more modern language this means that the crystal and the organism do not stand on the same ascending line, and that contrasts between them are hence naturally to be expected.

As for the origin of life we must seek deeper. It may perhaps yet be found, though, considering the vast complexity of the humblest organism as compared with the crystal, it may possibly for ever elude human search. But taking the worst case: supposing that life took its rise, as

* Journal of Science, 1882, p. 401.

Darwin admits, in the manner commonly called miraculous, is that any reason that we should adopt the theory of mechanical, individual creation? There are writers who contend that if the origin of the first living being demanded a breach of the law of continuity, a direct Divine interference, every animal and vegetable form may have taken its origin in the like manner. To this argument we oppose the "principle of parsimony," which bids us not invoke a "*Deus ex machina*" where it is not absolutely imperative. We see, further, if we are able and willing to weigh fairly the evidence, that God did not mould every plant and animal on the "contract" principle of the Old School, but allowed them to be evolved by "descent with modification" from anterior forms of life.

We have now to notice a portion of Mr. Howard's pamphlet which we would gladly pass over were if not essential for an understanding of his position and his *animus*. We refer to the manner in which he, in his attack upon Evolutionism, drags in Auguste Comte and Positivism. He writes in his "Conclusion":—"There is an irreconcilable opposition, a total contrariety, between this doctrine [*i.e.*, 'that life is a gift of the Almighty'] and the religion of M. Comte which would wholly subvert the existing order of things. The adherents of Positivism and the disciples of Darwin are sufficiently outspoken on these subjects." He quotes, in a note, the "Gazette des Tribunaux" for March 2nd, 1870, describing Comte's repudiation and desertion of his lawful wife, who had been his faithful companion and nurse during an attack of insanity, and his—to us—disgusting *liaison* with Clotilde de Vaux, the wife of a convict.

Now supposing any of those "average English minds" whose "impracticably practical character," "strong common sense,"* and "attachment to cherished traditional opinions" the author has vaunted, reads and considers the matter we have just quoted. Will he not, finding Comte and Positivism suddenly introduced in so unfavourable a light in the peroration of an attack upon Evolutionism, be led to suppose that the two doctrines are closely allied, and that Comte was probably a forerunner and fellow-labourer of Charles Darwin? Now we are not at liberty to assume that Mr. Howard wished or intended that his readers should fall into this mistake. Yet he has certainly taken no pains to save them from so gross an error. Personally he must

* This is a thing of the past. The Englishman of the present day has small claims either to practicality or common sense, and is, of all civilised nations, the most easily thrown into a state of panic and stampedo.

know—at least we cannot insult him by the contrary supposition—that Auguste Comte was an upholder, even as Cuvier, Agassiz, or Dawson, of the permanent distinctness of organic species; he must know that, with perhaps the single exception of George Henry Lewes, the Positivists, with their present leader Robin, take the same view, and condemn Darwinism in language sufficiently vigorous. Many of Mr. Howard's hearers must also have been fully aware of the fundamental opposition—the difference *toto cœlo*—between Evolutionism and Positivism, between Darwin and Comte. Yet none of them, as it appears, in the subsequent discussion had the candour to point out the misconception to which the speaker's words might give occasion. They allowed, tacitly at least, the moral shortcomings of Comte to prejudice the public against the doctrine of Evolution.

We have, of course, no wish to defend either Comte or his followers. We regard them as enemies to Science, especially as regards physiological experimentation, and we are anxious merely that their full antagonism to Evolutionism should be clearly recognised. At the same time it may, perhaps, be questioned in how far an exposure of the moral errors and shortcomings of any writer may legitimately be used for the refutation of his theories? It may further be denied that Evolutionism is or can be, if rightly interpreted, "subversive of the existing order of things." That order, from the very fact of its existence, must be in some degree in accordance with man's nature and with his surroundings. Those who believe in catastrophism, in sudden destructions of all living, and in re-creation, may aim at revolutions in matters social and political, but the consistent Evolutionist can indulge in no such aberrations.

M. de Casamajor introduces his attack on the New Natural History in a somewhat different form. He entertains fears that "the Christian family is attacked; that Episcopacy, the Councils, and the Pope are calumniated"; and hence he wraps up his onslaught on Evolutionism in a series of essays on higher education. He, like M. l'Abbé Moigno, proposes to "become offensive." In what sense he succeeds in so doing may be judged from the following passage:—

"XI. Darwinism supposes two impossible facts. 1. Life derived from brute matter. 2. The existence and growth of a being cast naked and feeble upon the earth."

"1. Life does not spring from blind matter. If in fact the inherent forces of matter, or chance, have been already able to form organised beings, why in our days do we not see in the air, in the ocean, on the mountains or the plains,

the sudden appearance of a living creature the origin of which could be with certainty attributed to inorganic matter?

"2. And how, deprived of maternal cares, could a young animal subsist without experience and strength?

"How could the young sparrow, when commencing to live, preserve its existence if its parents did not bring it regularly either the insects or the seeds and the fruits necessary for its support?

"I see it, this frail and delicate creature: it succumbs after true sufferings caused by cruel hunger. If the mother does not keep the young swallow warm it must soon perish under the influence of cold; its eyes contemplate the light, and darkness then infolds them; life with a red blood circulates in its veins, in its arteries, and the icy hand of death soon stops it; its brain and nerves had placed it in connection with the external world, but deprived of their exquisite sensibility they cease to perceive the radiance of the sun and sounds full of harmony.

"No! a creature at the outset of its existence cannot be thrown *feeble and naked* upon the earth, and still preserve there its life.

"There was required, at first, for every species, a being completely formed, a being whose body, instincts or reason were entirely developped; parents were necessary created in their adult age.

"Darwinists *admit* consequently as true, as a fundamental principle of their theory, an *impossible fact*."

We have transcribed literally this passage from our "offensive" author lest we should be suspected of wickedly perverting his line of argument in order to make him appear ridiculous. Few persons, indeed, would be able to conceive that a man of any education could seriously put forward such a misconception, not to say misrepresentation, of Evolutionist doctrines.

It is no part of the teachings of Darwin—as M. de Casamajor might see from the concluding passage of the "Origin of Species"—that life sprang originally from "blind matter." Nor is such an assumption in the least necessary for the validity of the Evolutionist theory of the organic world. We may even go a step further, and ask how does M. de Casamajor know whether or no in our days a living creature, previously unknown, has or has not ever suddenly made its appearance? How would he distinguish between such a creature and one which might have existed for thousands of years, but had hitherto escaped observation? Darwin supposes—whether rightly or wrongly is for the moment

immaterial—that new forms do not "suddenly" appear, but are the outcome of cumulative changes, each step so minute as to escape observation.

Turn we to the second difficulty which M. de Casamajor encounters—the question how a young animal, devoid of experience and strength, could exist without maternal care? This seeming "impossible fact" is got over to the present day in perhaps the majority of animal species. Many reptiles and amphibia, most fishes, the majority of insects and mollusks, not to speak of lower forms of life, deposit their eggs and leave them to the tender mercies of the world. Such an egg receives and requires no more parental care than does the spore of a fern. Darwinism does not suppose the production of any but the very lowest forms of life except by mature parents. And amongst the Protozoa we find propagation without the slightest approach to the relations of parent and offspring.

Darwinism, in short, does not suppose the two impossible facts which M. de Casamajor is pleased to rank amongst its fundamental doctrines. Is it any transgression against courtesy if we, on our part, express the wish that before condemning Evolutionism as he does, he would at least make himself accurately acquainted with its peculiar tenets, and not ascribe to it *Hirngespinste* of his own. Might we not remind him of the desirability of making himself better acquainted with the conditions of animal life, and thus escape the error of declaring that "every species" requires in infancy the fostering care of parents?

We will now venture to assume "the offensive," and to enquire into the necessary results of the origin of animals, if it had taken place in the manner recognised by traditions and by the Old School of Natural History. Let us suppose that a pair of every animal species has been suddenly and specially created within the interval of (say) two or three literal days, and set at liberty to seek its sustenance: how will such sustenance be found? Everyone who has even a popular acquaintance with animal life is aware that multitudes of species subsist only upon the refuse and the *débris* of pre-existing animal or vegetable life. We have in most of the great groups carrion-feeders and devourers of excrement. The bones, the flesh, even the wool, the hair, the feathers, horns, and hoofs of defunct vertebrates furnish support to the hyænas and the dog tribe, to the vultures and the crows, to fishes too numerous to enumerate, to carrion and dung-flies, to moths of the group Tineidæ, to the necrophagous beetles, the Sphæridiidæ, the Staphylinidæ, the

coprophagous Lamellicorns, and other groups which it would be equally needless and tedious to mention. We have then the parasitic groups, entozoic and epizoic, to be provided for.

In like manner the refuse of the vegetable world—wood, leaves, &c., in various states of decay, furnishes a pabulum for a host of beetles, myriapods, certain lepidopterous larvæ, for the land-snails, and even for the earth-worms, whose diet consists largely of humus. It may well be asked how, on the mechanical creation theory, could all the above enumerated groups find support save on the assumption of a perfect complication of miracles? We have heard it suggested, by an adherent of "brachy-chronology," that the fossils, animal and vegetable, which we discover in the earth's crust are not the remains of extinct species, but mere *simulacra* "for man's illusion given." Are we, in the same spirit, to assume that this earth was created ready stocked with carrion and excrement, with decayed wood and withered leaves?

How beautifully simple, on the other hand, is the Evolutionist view which supposes that, as any kind of refuse matter became abundant, some animal form, impelled by the struggle for existence, adopted such refuse, first as a portion of its diet, and then as the whole, its habits and its structure becoming modified accordingly. On the mechanical-creation hypothesis the eater would in many cases precede its food, whilst on the Evolutionist hypothesis the food would precede the eater, which would take advantage of the new opening.

Both the writers whose views we have been discussing approach Evolutionism from an ecclesiastical point of view, and both seem to regard it as hostile to and irreconcilable with Christianity. Says Mr. Howard, in the opening passage of his pamphlet, "It has been supposed that the notion of Deity, or of an omnipotent creative and sustaining power, may be thus removed to a greater distance from the human mind; and the unwelcome thought of responsibility to a higher tribunal than those of earth, and of subjection to an eternal judgment abolished." Here is a distinct, a grave, and we hesitate not to say an utterly baseless, imputation. Mr. Howard here insinuates, if he does not directly assert, that the motives of Darwin and of his coadjutors and disciples have not been scientific, or at least not purely so, but that they have been actuated by other considerations —by a hostility to revealed religion. Now there is no evidence whatever in support of this charge. The true man of Science does not go forth in search of the extra-scientific

bearings of his conclusions. Darwin, as far as we know, had simply in view to display the phenomena of the organic world in a form worthy to be called scientific. Some of his disciples, as well as not a few of his opponents, are heterodox; but that they are heterodox because Evolutionists is simply a railing accusation. Mr. Howard would do well to reflect that Mr. Wallace, Prof. St. George Mivart, Dr. Drysdale, Dr. Dallinger, and numbers of leading Evolutionists both in this country and especially in America, repudiate Atheism as distinctly as does the "Victoria Institute."

It may perhaps be contended that Mr. Howard is not speaking of Evolutionists in the passage which we have quoted. Let us therefore look further. He writes:—"It might almost be said that they [the prophets and teachers of this new doctrine] form a mutually supporting and a somewhat exclusive sect. . . . It is not the present generation of Englishmen who will be reconciled to the thought that they are in their origin viler than the sea-weed, and in their gradual fashioning improved out of the most lowly organised animals that the earth and the sea support."

Lest this should not seem sufficiently decisive, the author refers to and quotes in his Appendix a passage from the "Edinburgh Review" of April, 1873. It runs:—"The practical influence of the new doctrine is seen in the rise and rapid growth of a pseudo-scientific sect—the sect of the Darwinian Evolutionists. This sect is largely recruited from the crowd of facile minds ever ready to follow the newest fashion in Art or Science, in social or religious life, as accidents of association or influence may determine. . . . The evidence in favour of the central Darwinian doctrine is notoriously deficient, but this is no hindrance to its enthusiastic acceptance. . . . Another note of sectarianism is their tendency to intolerance. The tendency is manifested, perhaps, in its extremest form amongst the rank and file of the sect. It displays itself, however, in various shapes, some of which are amusing enough. This tendency to intolerance appears also in the writings of the school, especially in the less distinguished. The tone of the discussion in many cases involves the tacit assumption that the Evolutionists are the only wise men, and that wisdom itself will die with them." Who is the writer quoted we know not. For anything that appears to the contrary he may be some *litterateur*, unwilling and perhaps unable to weigh the evidence in favour of Evolution with the patience which it demands. The "sect," as he calls it, has secured the adhesion of the great majority of

working naturalists, and finds its opponents chiefly among those who know it by hearsay or by dipping into the "Origin of Species." The charge of intolerance comes with a singularly bad grace. We know of no Evolutionist writer, even the "less distinguished," who has sought to rival the adherents of the Old School in the use of offensive language, in appeals to passion and prejudice, in misrepresentation, or in personalities. Every year that passes seems but to strengthen the evidence in favour of Evolutionism, and to win for it more general acceptance among patient searchers for the truth.

II. PATENT RIGHT AND PATENT-LAW.*

By An Old Technologist.

THE question of patent-right and copy-right is at present in a most unsatisfactory condition. Experts, or persons who at least profess themselves such, differ not merely as to details and points of expediency, but as to first principles.

We cannot even agree whether a Patent is the registration of an inventor's property in his own ideas, or the grant of an especial privilege which the State may confer, but which is still a phase of "monopoly" and a sin against our modern English deity, "free trade." To me it seems that in this discussion the ideas of monopoly, protection, and free trade are essentially foreign. If any property is to be held sacred, surely that of a man in the creation of his own brains must hold that position. A new book or a new invention is something which heretofore had no existence. The author or the inventor has not appropriated to his private and exclusive use something which previous was common and open to the public. He has not limited the

* The Government Patent Bill of 1883.

The Patent Bills of 1883: Private Aims and Public Claims. By R. A. Macfie, F.R.S.E. Edinburgh: T. and T. Clark.

Copyright and Patents for Inventions. Vol. II. By R. A. Macfie. Edinburgh: T. and T. Clark.

scope and the field for the exertions and the enterprise of other men; on the contrary, he has in many cases opened out new tracks. In what legitimate sense his claims can be called a privilege and a monopoly I do not see. According to Coke's definition a monopoly is a grant or decree of the ruling power, by which some person, company, or corporation is invested with the exclusive right to manufacture or sell certain goods, or to perform other actions which were previously open to the public in general.

To take an instance: the East India Company was formerly endowed with the exclusive privilege to trade to India, China, and in general to countries situate eastwards of the Cape of Good Hope. This was evidently a monopoly, because previous to their charter any British merchant might, if so disposed, trade to those countries, and was afterwards prevented from so doing. On the other hand, suppose John Tomkins invents a dichroic dye, which when applied to silks gives them a beautiful rose colour when seen in one direction, and an intense green when viewed in another. He applies for and obtains a patent. But the exclusive right which he thus holds deprives the public of nothing, since prior to the invention of John Tomkins they could not make this dye.

Even Mr. Macfie, who can scarcely be accused of too strong a bias in favour of the rights of inventors, says, in his evidence before the Commons' Committee in 1871, very much the same thing:—"They are not deprived of anything that they had before. Patents do not deprive you of any rights. The theory is that a Patent creates something that did not exist before. With regard to the old monopoly it was a grant of something in existence, such as the sale of sugar or salt; in fact there was hardly anything that was not a subject of monopoly in the old times, and there the public were deprived of something." It is surely therefore to be regretted that such terms as "protection" should still be retained, and that reference is still made to the "Statute of Monopolies." These very words at once throw free-trade champions into a state bordering on *delirium tremens*, and make them fancy that they have, as such, a good *locus standi* in the discussion of the question.

But it is asked by the opponents of copy-right and patent-right, why, if there can be property in ideas, are not the author and the inventor secured in the enjoyment of their rights for ever, instead of for a limited term? This is a very difficult question to deal with. In the German empire copy-right is, I believe, perpetual. It is to be considered that the value of a book or an invention is greatest immediately after

it has come into notice, and in the course of a century becomes, in all ordinary cases, almost null. Thus if a perpetual property were granted the author or inventor, or his assignees, might very probably in course of time abandon their rights. But we must also remember that not merely property in ideas, but property of other kinds, is in these days called somewhat rudely in question. The Communard and the Sans Culotte, unwilling or unable perhaps to work and to accumulate, inveigh against the landholder and the capitalist as monopolists. In the very same spirit the man, rich or poor, who can invent nothing cries out against Patent-right because it prevents him from appropriating his neighbour's ideas without payment. He longs for the abolition of Patent-law just as do his brethren above mentioned for the confiscation of real property, the seizure of the "unearned increment," and similar drastic measures which cannot here be discussed. It is admitted that the limitation of copy-right and patent-right may seem to imply that they partake rather of the nature of a privilege than of property. But it will not fail to be noted that ordinary property is being subjected to increasing limitations. Among these rank the succession-, probate-, and legacy-duties, which on every occasion of a transfer greatly curtail its amount, if not its duration.

It must also be remembered that we in England, unlike other nations, grant perpetual monopolies to persons who do not originate anything, but who do merely what any other man or association of men might have done just as well. Suppose a number of capitalists club together, and propose to supply any town or district with water. It is plain that here is no novelty, invention, or improvement. The methods of collecting and storing water in reservoirs, of conveying it in mains, and of distributing it in service-pipes are as well known as is the art of building a house. Yet on their application the Legislature will grant them a perpetual property not merely in their erections, tanks, culverts, and other works, but in the exclusive right to supply the town in question with water. If the inhabitants, weary of the extortions and malversations of such a company, wish to take the matter into their own hands, they cannot erect other water-works in opposition, but must buy off or "compensate" the company. Why should we give the inventor so much more unfavourable terms than we grant to the speculator and the projector?

But leaving the consideration of abstract right, which I hold to be decidedly in favour of the inventor, let us turn to

the question of expediency. Is the recognition of the inventor's property in his ideas beneficial or otherwise to the nation? Are the interests of the patentee and those of the public in harmony or in opposition? It will be of course admitted that, to hold our position as a great industrial community, we stand in continual need of improvements. We must make our goods either cheaper or better than we did before, and we must from time to time begin to make something new,—something which has not been made before. In a word we need invention: what is the best article to-day is no longer in the same position to-morrow; what suits present wants will not always meet the requirements of the future. If we stand still, our enemies—I use the term advisedly, for international competition is only a modern phase of war—will not follow our example, and we shall be left behind. We must therefore have a constant supply of inventions. For this purpose we must make it remunerative to invent. Few persons in this world will work persistently for nothing. It has indeed been cynically said, by some one of the talkers and writers whom Mr. Macfie delights to quote, that the inventor can no more help inventing than a hen can help laying eggs. Granting this provisionally, though egg-laying and inventing may be and often are stopped by sheer starvation, the hen may "lay away," and the inventor may go to some country which will register his property in his invention on more favourable terms than England offers,—which will give him longer security for a lower charge, and without the chances of lapsing. This is actually taking place. Some of the opponents of Patent-right say, again, that we can well spare those who leave us! Is this reason or infatuation? Further, the more difficulties we throw in the way of the inventor the fewer persons will aim at any improvements in arts and manufactures.

Would it not be better for the nation at large, and for themselves, if our working men sought to raise themselves by inventions rather than as at present by trades-unionism and strikes? But if we concede so much, what must we say of the policy of placing it substantially beyond the power of a working man of average position to obtain, and still more to maintain, a Patent? America acts on the opposite principle, and profits thereby. Many workmen there are busy with inventions and improvements who under our Patent-law, or if under no Patent-law at all, would become idlers or demagogues. Germany saw that many of her best men went to other countries where an efficient Patent-law prevailed, and introduced their inventions there.

To prevent this loss she enacted a Patent-law in some respects more liberal than that of England, and since then her inventors remain at home. They take out English Patents, doubtless, but they are very careful not to work them in this country.

We are trying to give our artisans a sound technological training, that they may be able to understand the principles of their respective trades, and be able to effect improvements. But all this is idle so long as we give the educated artisan no inducement to use his trained intelligence. A good Patent-law creates good industrial education.

The case stands thus :—

Without improvement no trade.
Without invention no improvements.
Without Patent-right no inventions.

I know it has been said that an inventor may work his invention as a secret process without seeking the protection of the Patent-laws. This method is one which in certain cases I have recommended to persons who have sought my advice. But it is practicable only (1) when the inventor is actually engaged in the business concerned, or is at least a capitalist; (2) when the invention does not require very bulky and conspicuous plant, or the presence of a great number of workmen. I should have little faith in the possibility of keeping secret a new process for the manufacture of alkali, bleaching-lime, &c. New dyes, pigments, &c., may be manufactured successfully on the secret system, though everyone conversant with chemical industry cannot fail to note that the German manufacturers of artificial colours invariably patent their processes. They have, it would seem, little faith in secret working.

It is said that an inventor may succeed in disposing of a process for a fair value without the formality of a Patent. I doubt it: the would-be or might-be purchaser generally declines to buy a cat in a bag. He demands not only to see a sample of the article, but to be informed, before the completion of the bargain, as to the working details of the process. When matters are come to this point he is bound merely by honour. If this sentiment is weak, as is sometimes the case among the moneyed interest, he may break off the negotiation by saying "After all I do not see that the affair will suit my purpose," and may then begin the manufacture forthwith! This is no mere supposition, as several cases have come under my personal observation where an inventor has thus been defrauded. Indeed I have

only met with one instance where an alleged invention has been sold for a good round sum of money without having been previously patented. In this case I fear that the purchaser was the unfortunate party, since the secret—if there is any truth in the history of chemistry—was perfectly known to the Egyptians in the days of Moses!

Mr. Macfie is reported to have mentioned, not long ago, as one of the objections to cheap Patents, that they would enable a working man who came upon any improvement to secure it for himself instead of handing it over to his employer!

Perhaps it would not be unreasonable if those eminent men, economists, members of the chambers of commerce, and others, who entertain such strong objections to Patent-right, would point out some other feasible way in which an inventor might obtain at any rate some little remuneration for his trouble. To sum up this part of the subject, my conviction is that the interests of the public and of the *bona fide* inventor are substantially at one.

Still I am very far from conceiving that the matter is free from difficulties. Among the objections raised by Mr. Macfie, and by the public characters whose evidence he quotes against the working of our present Patent-laws, and indeed against any Patent-law, there are some which cannot be justly ignored, and in many cases—let our law-makers do their best—there will remain but a choice of evils.

I take it for granted that the original object or purpose for which a property in inventions was recognised was the introduction of new arts and manufactures into the country, or the improvement of such as already existed. To this end Patents were granted not merely for inventions originating in the United Kingdom, but for such as were imported from abroad. Such importation might be effected in two ways: either a British subject when travelling might observe the particulars of some improvement, and introduce it into this country on his return, or an alien, resident abroad, might communicate an invention to some resident in Britain. But in any case the end was the introduction of a new manufacture into the country. Now, partly in consequence of the defective state of the Law and partly from the rulings of the Courts, there has crept in, as regards these "communications from abroad," a complete departure from the original intendment of the Patent-system. The following cases are quite common: an alien, in possession of an invention which he either has patented or intends to patent in his own country, comes over for a time to this country, and obtains

a British Patent; or the alien aforesaid instructs a British Patent agent to apply for a Patent as a "communication from abroad." In neither case has the alien in question even the remotest intention of working the Patent granted him in the United Kingdom. His object is the very opposite,—to prevent it from being so worked. Hence if any English manufacturer applies for a license under the Patent he meets either with a direct refusal or receives the offer of terms which are practically prohibitive.

Referring to this abuse—for such I must venture to call it—the Society of Chemical Industry writes:—"There are at this moment numerous Patents for the obtaining of artificial colours, which Patents are held by large Continental manufacturers, who, not being compelled to grant licenses, continue to send their products into this country, and thus prevent their manufacture here."

There is a closely analogous case mentioned by the same Society, which may not ever have actually occurred, but which is still possible, and against which we ought to beware in time. An Englishman, holding a British Patent for any invention, might, if so disposed, remove his establishment to some foreign country in which he had also obtained a Patent, or in which Patent-right does not exist, and thus inflict great injury on his own country. Says the Society of Chemical Industry:—"We would suggest that if Neison, who obtained a Patent for applying hot instead of cold air to blast-furnaces, had formed a company with the object of monopolising the whole of the iron trade, he could, if he had been specially interested in Continental coal and iron mines, have annihilated the immense capital at that time embarked in that industry in this country, and might have ruined large and important manufacturing districts."

Against these two evils, the former of which is actual and increasing, whilst the latter is by no means improbable, some precautions have been suggested. In the three abortive Bills for Patent Law Amendment which were brought forward under the administration of Lord Beaconsfield it was proposed that any Patent should become void if the patentee did not succeed in bringing it into use, on a practical scale, before the expiry of the third year. This proviso was much too sweeping. An inventor who is not at the same time a capitalist rarely succeeds in getting his invention taken up so early as the third year. Manufacturers hold back intentionally, in the hope that he may be unable to raise the £50 required for the third year's stamp-duty, and may thus forfeit his rights. Were it known that such a Patent would

be inevitably forfeited unless in full action within this short term, the present reluctance to come to terms with the patentee would be very much strengthened. But the following stipulation might form part and parcel of our Patent-law:—"That if any person holding a Patent for the United Kingdom and for some foreign country shall work the said Patent abroad, but shall refuse either to work the same on a practical scale in the United Kingdom or to grant licenses to others on equitable terms, the Patent-right of such person shall lapse accordingly." This clause would, I think, effectually bar the door against the abuses to which the Society of Chemical Industry has so opportunely called attention.

It may be urged that foreign powers would in retaliation refuse to grant Patents to British inventors. I reply—Some States, such as Austria, France, and Belgium, already require as an essential condition for the maintenance of a Patent that it shall be worked within their respective territories. In other cases such a retaliatory movement might be met by treating any article patented in the United Kingdom but made abroad as contraband.

An objection has been widely raised against our present system of granting Patents to all applicants without any examination as to their novelty. This evil undeniably exists. Over and over again I have met with Patents claiming anew, and sometimes, *totidem verbis*, what has been previously claimed in older Patents, whether lapsed or still valid. French inventors seem to me particularly liable to fall into this error. Such re-patenting should certainly be brought to an end. To grant such a Patent is unjust to the second applicant, and, under certain circumstances, still more unjust to the public. The judges unfortunately, perhaps from their limited acquaintance with technical questions, show a certain degree of timidity in dealing with such re-patenters, who are thus sometimes enabled to blackmail the manufacturers for working a process which has long been in reality public property. It is satisfactory that the Patent Bill of the present Government proposes to submit all applications for Patents to the scrutiny of examiners better qualified for the task than the law-advisers of the Crown.

A defect in the present law is that Patents are granted for medicines, for articles of food and drink, and substitutes for such articles. An open door is thus provided by the State for quackery, for fraud, and adulteration. It has been suggested that were these articles, as in Germany, excluded from the protection of the Patent-law, and if the proprietors were debarred from bringing suits for libel, slander, or

defamation, in reply to criticisms on their products, quackery in many of its forms would be swept from the country. But on this subject the Government Bill is dumb.

With chemical Patents there is a special difficulty. Shall new chemical compounds be patentable in themselves, or merely the processes by which they have been obtained in any particular case? The German Patent-system takes the latter view, holding, rightly enough, that some better, cheaper, or otherwise preferable method of obtaining any new compound may be discovered. If the compound itself is patentable, the public would be deprived of the benefit of such future discoveries. It must, however, be noted that many of the chemical manufacturers of Germany are by no means satisfied with this restriction. On the other hand, it is an unedifying spectacle, when a Patent has been taken out, to see claims for obtaining the same article, by means of agents, simply equivalent to those specified in the original Patent. Of this there was a typical instance in the many Patents obtained for the manufacture of magenta. On this point the new Bill is also silent.

It is possible that the proposed examination of the specifications and claims of all new applications may put an end to what are called "fishing" or "trailing" claims. Some inventors, whether from a natural turbidity of thought or from a desire to reap what they have not sown, draw their claims in such a vague manner as to be incomprehensible. Nowhere in a legal or business document is absolute clearness more necessary than in a Patent-specification. Any person conversant with the branch of manufactures in question should be able to see, without the shadow of a doubt, what is claimed and what is left open. I trust that the knowledge of the official scrutiny to be passed will cause both inventors and their Patent-agents to be more careful as to the language they employ.

If we get rid, for the future, of all Patents which are in whole or in part merely a re-claiming of what is already public property,—of all patents held by aliens, and not worked in this country,—of all "fishing" claims designed to entangle future inventors, and of the class of "quantum valeat" or "bogus" Patents, it will be the better for the genuine inventor, and Mr. Macfie and those who think with him will find many of their scruples removed.

Space being available, I hope to return to the consideration of this subject.

III. DARKER SHADOWS: A SOCIOLOGICAL STUDY.*

By E. S.

[WE cannot allow the following article to appear without a prefatory tribute to our departed friend and contributor, Dr. G. M. Beard. Differing from him—and agreeing to differ—on points neither few nor trifling, we always found in his writings subjects for grave, and we trust not unprofitable, reflection. He was one of that rare class of thinkers who discuss matters to which the world is glad to close its eyes, and who dare to utter their thoughts. Few men would, like to him, have ventured to tell the American people that Guiteau was not a criminal to be punished, but an irresponsible lunatic to be placed in safe keeping. Fewer still would have presumed to say that America, and to some extent the whole civilised world, in seeking to make every man, woman, and child an expert in politics, is sapping the very vitality of the human race. George Beard was a man whom we could ill afford to lose, and whose early death we bitterly regret.—THE EDITOR.]

DARKER shadows? Two months ago it was my lot to point out an ethnological phenomenon boding evil for the great English-speaking community across the Atlantic. It is now my yet more unpleasant task to discuss a calamity which has already begun, and which affects America, Britain, and all civilised portions of the earth, almost exactly in proportion to their civilisation.

There are few educated persons who have not read, in part at least, the memorable speech delivered by Mr. Herbert Spencer at the close of his visit to the United States. Few, however, are aware how closely this startling oration approached in its leading views the teachings of the late Dr. G. M. Beard. The last work of the distinguished neurologist whom we have so lately lost pointed out these approaches as a singular coincidence. It contains, in parallel columns, passages taken from Mr. Spencer's speech and extracts from

* Herbert Spencer on American Nervousness: a Scientific Coincidence. By G. M. BEARD, A.M., M.D. New York: G. P. Putnam's Sons.

Dr. Beard's treatise on "American Nervousness," as published in 1881, and no one who glances over the two can fail to be struck with the general sameness not merely of the thoughts, but even of the expressions. Thus Mr. Spencer declares:—"In brief, I may say we have had somewhat too much of the 'gospel of work.' It is time to preach the gospel of relaxation." In juxtaposition we read from Dr. Beard's treatise:—"The gospel of work must make way for the gospel of rest." These two passages give, in either case, the key-note to what follows. Dr. Beard raises the question whether there is here unconscious appropriation on the part of Mr. Spencer, or whether both writers have borrowed from some common sources? He comes to no definite conclusion. It is no part of my duties to complete what he has left incomplete, and either to condemn or to absolve Mr. Spencer of unacknowledged appropriation of the thoughts of others. My concern is rather with the ideas than with their original source. Certainly if two writers, proceeding independently and by different methods, have arrived at conclusions substantially identical, these may, on that very account, claim the more respectful attention.

Mr. Spencer and Dr. Beard admit, in the main, that modern civilisation is a gigantic failure. The ancient civilisation, based upon a military organisation of society, we know wore itself away, and is incapable of revival. Still whilst it lasted it was in a great measure successful. The Roman was trained, both positively and negatively, for war, conquest, command, and organisation, and in these directions he proved unmatched for centuries, till he practically renounced the principles by which he had been guided.

The modern man, of Europe and America, has been trained with ever-increasing exclusiveness for getting and having, and for work in a limited sense of the word, as the means to such end. To use phrenological language, acquisitiveness has for the last four or five centuries taken the place occupied by combativeness in the days of classical antiquity and in the Middle Ages. What has been the result? It is by no means pleasing to contemplate. The resources at the command of man have been, indeed, almost indefinitely increased. A variety of treasures, mineral and organic, which in former ages slumbered unrecognised in the earth or in the woods, have been detected and brought into play. Various kinds of waste and refuse, which were once a mere encumbrance, are now made sources of wealth. The labour of men and animals, always costly, is in numbers of cases superseded by the cheaper agency of mechanical

power, by the steam-engine, and the turbine. The productiveness of the earth is in many parts greatly increased. Above all things the transmission of intelligence and the conveyance of travellers and merchandise, whether by land or water, have been rendered safer, speedier, and cheaper. In this manner the total wealth of the world has doubtless been increased. Doubtless, also, all classes of society enjoy certain conveniences and luxuries to which their forefathers were strangers. But it must be distinctly asserted that life has not, as might be expected, been rendered easier. As a certain weekly organ of anti-vivisectionism and political economy hath it:—"The class which uses its brains works as it never yet worked, and is harassed as it never was harassed before, till physicians are recognising over-work as a specific cause of disease." It is sometimes asserted that the handicraftsmen, those whose labour is to a large extent performed by the muscles, have been the gainers in modern times. In England their hours of work have been reduced, as far at least as the building trades and the large staple manufactures of the country are concerned. But this shortened time does not prevail in all countries, and is indeed one of the special difficulties which the English manufacturer has to contend against as compared with his foreign rivals. Yet it does not extend to the very numerous class engaged in distribution especially by retail. Many persons thus employed enjoy the opportunity of working twelve, or sometimes even fourteen, hours daily. In some of the establishments of the monopolist drapers, which are now becoming so plentiful, the clerks, warehousemen, and other assistants are not unfrequently required to work all night without payment for "overtime," such as the carpenter or the mason receives. But the reduction of working hours, even where it exists, is more apparent than real, if we look back for a couple of centuries. In the olden time holidays were more frequent than at present. Persons still living can name at least one manufacturing town in England where work was not generally resumed between Christmas and New Year's Day. Shrove Tuesday, Easter, May-day, the "feasts" or "wakes" in the villages, and the yearly or half-yearly fairs in the country-towns, all involved the cessation of labour for a day at least. Again, a much larger proportion of so-called working men were, a century ago, engaged either on their own account or were employed by "little masters," whose business was not carried on with the undeviating regularity of a modern factory. The hand-loom weaver of Lancashire or Yorkshire could work when he liked

and "play" when he liked. Summing up all these considerations it may be fairly asserted that the handicraftsman devotes a greater number of hours in the year to work than did his predecessors prior to the installation of the "factory system." And what does he earn by the greater regularity and stringency of his labour? Hallam has shown, in his "Constitutional History of England," that in the reign of Queen Elizabeth the wages of a working man represented a greater quantity of the necessaries of life than they have ever done since. In other words, the margin between every man and actual want is narrower than it was formerly. As a matter of course there is much more anxiety. Nor is the case very different in other countries. Dr. Beard says that, in the present day, for the vast majority of Americans, the great question is not "How shall we live?" but "Can we live at all?"

Is this state of affairs, if duly weighed, a satisfactory result, especially in an age which avowedly makes the acquisition of material wealth almost its sole object, and which brands all men not engaged in such pursuit as idlers? What, it may be asked, is the fundamental meaning of that cry for "cheapness" which is everywhere encountered, and which serves as the pretext for so much dishonesty? Surely it means that the resources of the people fall short of their needs to an extent hitherto unprecedented. Times have been when the reverse proportion held good, and when certain classes of people were hence formally debarred by sumptuary laws from indulgences and expenses deemed unfitting their station. Small need in these days for such regulations!

But I may venture to go further: if a man's whole time and powers are taxed—not to say over-taxed—in earning his "living," he exists to no purpose. He may be likened to a machine whose motive power is entirely consumed in overcoming friction. This judgment, that a life spent in merely earning a livelihood is a life in vain, applies alike to cases where such livelihood consists of potatoes and water, in the hovel of a Connemara peasant, and to those where it involves the rarest wines and the costliest viands ever served up in the mansion of a financier. This view may not be fashionable, but that it is capable of being controverted I strongly question. Assuming it as true, I ask is life becoming easier? have men to spend less of their time and powers in earning a "living," and can they reserve more of both for life? Considerations have already been brought forward which answer both these questions in the negative. But every one who has looked around at the world will require no reply.

Before boasting, as some of us are apt to do, of our "labour-saving" inventions,—commonly so called,—let us remember that there are two distinct ways in which such appliances might have been utilised. We have made our choice of the one, and the other is no longer at our option. An illustration will make my meaning clearer. Let us go back to the time when factories were literally *manu*factories. In the village of Elsewhere dwells, say, a weaver, who, by dint of working at his hand-loom for twelve hours daily, contrives to earn that vague something which outsiders term a "decent livelihood." It is plain that he is one of those men above mentioned whose lives are in vain. When his daily toil is ended he has little scope, little ability for anything save rest in its extreme form of bodily and mental inaction. Let us now suppose that he invents and constructs a machine of which others are ignorant, by means of which he can get through his day's work in six hours. He stands now at the crossway, and asks "To the right or to the left?" A moment, and he has decided to take the left-hand road. He resolves to do double the work he formerly did, to earn double the money, and to "rise in the world." I need not describe in detail all that ensues, since it has passed, and is still actually passing, before our eyes. Let us therefore return to the inventive weaver whom we left pondering at the crossway. Suppose he turns to the right! Suppose that he is content to earn the same amount of money as he did before —to live in the same plain style, and to employ his machine, not for increasing production, but literally for saving labour. Suppose that similar inventions are brought to bear in other trades, and are applied on the same principle. What then will be, or rather would have been, the result? No very rapid increase of population or of wealth; but a people vigorous, healthy, unworn with anxiety, working to live but not living to work, and possessing full opportunity for self-culture. Would not such a state of things have been preferable to the feverish struggle into which we have been plunged?

I will now take a glance at some of the more prominent phases under which the failure of modern civilisation makes itself manifest. We have under its inspiration stript our own country, over a great and increasing part of its surface, of every beautiful feature. We have blackened its skies with smoke-clouds, polluted its air with sulphurous acid, filled its streams with liquid filth, covered its hills with "spoil-banks," blighted its green fields, cut down its woods, and extirpated many of its most lovely animal and vegetable

species. We have handed over Thirlmere to the tender mercies of the Manchester Corporation, and, though there were abundance of ugly sites available, we have built Barrow-in-Furness where its fumes and its "roughs" may desecrate the vale of Dudden. Our cities, from London downwards, present, as their main feature, meanness, monotony, and ugliness by the square mile, rarely indeed relieved by a street or a single building upon which the eye may rest without pain. If we are ever reminded of man's craving for the beautiful we exclaim that this is a "work-a-day world," a "plain, practical age," and the like. But in those very phrases we pass judgment upon ourselves. Men have always had to work for their support; but till these very "advanced" days they found such work not incompatible with a love for the beautiful. Athens and Corinth of old were great commercial centres; so in later days were Venice and Genoa; Florence and Nuremberg were busy seats of successful manufacturers. But commerce and industry were not in those times considered to necessitate or to justify ugliness. Why should they now? To own that we have not the time, the energy, or the means to overcome the vileness and squalor which surround us, is to confess our modern system a failure.

Let us look at public health and vigour,—the subject most directly touched upon by Dr. Beard and Mr. Herbert Spencer. Here, too, we find the sacrifices which the industrial organisation of society and our dominant covetousness have demanded and received. It is all very true that the average duration of human life has increased, thanks to the greater care taken of infancy, to improved medication, and to cessation (temporary?) of those epidemics which decimated Europe in antiquity. But those diseases which speak of constitutional weakness, and from over-work under anxiety, instead of decreasing seem to augment. Softening of the brain, apoplexy, paralysis, heart-diseases, general debility,—in short, the whole class of "competitive affections," as they might be called,—are now fearfully prevalent. And to them our sanitary reformers say nothing! They wage war against the fever which carries off a man swiftly, but they care little about those lingering maladies which enfeeble successive generations. We are told, on good authority, that among the poorer classes in England mental disease has during the last forty years been multiplying at the rate of 300 per cent, whilst the increase of population is 45 per cent. The late President of the British Psychological Association warned us that if the growth of insanity continues

with its present speed the early part of the next century will see in this country more than a million of formally recognised lunatics, not to speak of the greater numbers outside the legal boundary of madness whose morbid whims will form the public opinion and the "national conscience" of the day, and who will constitute the blind followers of the blind. Or shall I rather say Gadarene swine inspired to suicide? On this ground alone the condemnation of modern civilisation may be unequivocally pronounced. Whatever customs, laws, institutions, or tendencies lead to mental disease, need no further investigation.

And what have the morals of the world become under industrial inspiration? We profess to be nothing if not ethicists. We make war, ostensibly at least against the "pleasant vices," but we enter into alliance with those that are profitable. We are clamorous against cruelty, and see it in very novel quarters, but our whole life is permeated with deceit and fraud. Scarcely is any article bought and sold what it professes to be. Scarcely is any business, public or private, done without some form of bribery or corruption. And all these tricks of trade are even defended in high places as merely avatars of the goddess Competition, who dominates us in the University, on 'Change, and in the Hospital. The philanthropy of the modern world is also of a peculiar kind. It shrinks from direct bloodshed, but it is willing to kill by hunger and misery. The fortunes of our "self-made men," in too many cases, cost a greater amount of human ruin and misery than the bloodiest laurels of classic or feudal warrior. The cry for cheap labour, to be gained, if need be, by the importation of the hostile alien, and even of the "heathen Chinee," is as merciless as the yell of Pagan Rome—"The Christians to the lions!"

Or, again, how does man fare intellectually under the industrial *régime?* The answer can be given briefly. All original work—be it in Science, in Literature, or in Art—demands abundant leisure. But the present system is constantly curtailing the leisure of brain-workers. The ultimate result cannot be doubtful. All research not aiming at direct profit will become rarer. We may have inventors, appliers, patentees in abundance,—some of them inventing, perhaps, new frauds; but we shall have a dearth of discoverers.

Lastly, I must ask how far is modern civilisation, under its present guiding ideas, promoting human happiness? To any person of common animal sympathies the weight of anxiety and distress, or else of grim, hopeless apathy, stamped upon the very foreheads of Europeans, and

especially of average Englishmen, is a sickening sight. A modern writer remarks that it is impossible to walk the streets of London and look in the faces of those we meet without feeling that nine-tenths of them had better never have been born. Even the successful minority have gained little. They may have at command luxuries such as their fathers never imagined; but what are they benefitted, having not the leisure and the calm necessary for enjoyment? Take the case of a man condemned to penal servitude. Would he feel much happier if his cell were decorated with the masterpieces of the upholsterer and hung with exquisite paintings? Very similar is the condition of the modern capitalist.

Our industrial civilisation, then, is found wanting in every particular. It has broken down more rapidly and more disastrously even than the military *régime* which preceded it, and will be found to have left upon the human race even deeper marks of its failure. The "gospel of rest, of relaxation" is pressingly needed.

IV. VICE AS AN ELIMINATIVE AGENT.

WE are in these days greatly exercised concerning sundry moral reforms. Our philanthropists hold that if certain vices, drunkenness most especially, could be eradicated, an immense benefit, social and economical, would result to the nation at large. In like manner other vices are attacked by special organisations, though it may be noted, in passing, that greed or covetousness—the cardinal sin of the nineteenth century—is mostly overlooked. There has prevailed great diversity of opinion as to the means to be employed in effecting these reforms, and on the comparative efficacy of moral suasion and legal compulsion; but concerning the end proposed we have, till very lately, complete unanimity. Quite recently, however, a different view has been brought forward. Mr. W. Mattieu Williams, in an article in the "Gentleman's Magazine," has sought to show that private vices are often useful to the public by

removing a certain class of persons who, if not dangerous, are at least useless. It will at once appear that we have here a reference to the "struggle for existence," which, whether we accept or reject the Darwinian hypothesis of the origin of species, must be recognised as a fact. More recently Mr. John McElroy, in the "Popular Science Monthly," has taken up the same idea, and given it a somewhat wider application. Many men whom we respect will at first glance be shocked at what they will call the "cynicism" of these writers. But it seems to us that their contention has in it an element of truth which has been hitherto thrust out of view, and which deserves serious consideration.

Let us, in the first place, call to mind what the "struggle for existence" really means. Almost every organic species produces such a quantity of spores, seeds, eggs, or young ones, as the case may be, that were no counter-agencies at work the world would soon afford neither food nor even standing-room.

Mr. McElroy writes:—"Even with such limited propagators as the elephant, each female of which produces but six offspring in her bearing period of ninety years, we are told that if the species had no parasitic or other enemies it would be only 740 years until elephants overran the earth. Where, then, should we assign limits to the productiveness of the seven hundred millions of human females on the globe, each of whom is capable of producing twenty children in her thirty years of bearing."

To keep this over-production within limits a variety of agencies are at work. There is a war between individuals of the same species, though, as far as man is concerned, modern politeness gives it the name of competition. In this war the weaker—*i.e.*, those less well adapted to surrounding circumstances—are trodden down. There is war between species and species. One form of life preys directly upon another, or consumes and destroys its nutriment. Diseases carry off multitudes before reaching their normal term of existence. Some animals, noted for their extreme rapidity of reproduction, indulge from time to time in wholesale suicide. The lemmings of Sweden and Norway march in a direct route to the sea, plunge in, and perish. Locusts and various butterflies and moths fly out over the ocean, and are chiefly drowned.

Mr. McElroy, however, is open to the charge of exaggeration when he writes—"Man alone is practically exempt from what is apparently an inseparable condition of all other forms of animal life. While he preys on a myriad of created

things, there is no created thing that preys on him and assists in keeping his excessive reproductiveness within the limits of subsistence. Most singular of all, not even a parasite wages destructive war against him."

Now we are of opinion that in many countries a not inconsiderable number of human beings fall victims to tigers, cobras, &c. The *Trichina* is to man a fatal parasite; so are the flies *Lucilia humanivora* and *L. macillaria*, which not unfrequently kill persons by depositing their eggs in the nostrils during sleep. And if Dr. Thomson, of Melbourne, and Prof. Koch, of Berlin, are not mistaken, the microbion of phthisis is a parasite which inflicts premature death upon about one-third part of the entire human race!

Still for all this mankind in all civilised countries threaten to outrun the means of subsistence. The farmers of Europe dread now American competition. But what will be the state of affairs in Europe when America has no surplus food to export? Yet that time, if we may judge from the results of the last census in the United States, is already within a measurable distance. In short, as a late eccentric physician once observed to us, "Nature, in her anxiety for the preservation of the human species, has sadly overshot the mark." The late Mr. Bagehot wrote—"How many Irelands have there been where men might have lived happily had they been fewer in number!"

Now in this grand system of over-production, kept in check by massacre, there is something not soothing to our feelings. Mr. McElroy exclaims—"The benignity of this method of arranging the order of Nature is not so apparent as a member of the Society for the Prevention of Cruelty to Animals might desire." It is true that the weak, who are now produced to suffer and perish, might never have originated. Suppose that every animal and plant, incapable of transmitting a healthy and vigorous organisation to its offspring, had been *ipso facto* incapable of reproduction, a large fraction of the present over-population, and consequent distress, might have been avoided. But we have to deal with what is, not with what might be.

Mr. McElroy's contention is, then, that the elimination of the surplus human population "is accomplished by making vicious inclinations the agents to weed out the redundant growths, and to select for extermination those which are inferior, depraved, weak, and unfit for preservation or reproduction." Again, "The surplus ones relieve us from embarrassment on this score by selecting and exterminating themselves. Their methods of suicide cover a wide range

of expedients, but all are very effectual. . . . Each of those chosen for extermination embraces his fate with eagerness, under the delusion that he is about to enhance his own happiness. Immoderate use of stimulants, and the various excesses and errors grouped under the general head of 'dissipation,' a 'life of pleasure,' or the still more expressive phrase 'a short life and a merry one,' are favourite plans of self-annihilation, and leave little to be desired in the completeness with which they do their work." He adds, "Vice is not so much a cause as an effect—not so much a disease as a symptom. Vice does not make a nature weak or defective: a weak and defective nature expresses its weaknesses and defects in vice, and that expression brings about, in one way or another, the sovereign remedy of extermination."

These views are in such flat opposition to the ordinary teachings of the pulpit, the platform, and the press, that they must be carefully examined. If Mr. W. Mattieu Williams and Mr. McElroy are right, our moral reforms and our philanthropic movements are simply attempts to frustrate what is, upon the whole, a beneficent arrangement for the improvement of the human race.

Let us look first at the case of intemperance, taking the word in its modern, technical sense. Our judges, our clergymen, our physicians, and many others who have had exceptional opportunities for observing, tell us that the excessive use of alcohol occasions the greater proportion of our criminals, lunatics, and paupers. The facts which they have at command are merely that the majority of these undesirable classes are drunkards. But are they therefore right in inferring that had they never tasted alcohol they would have been worthy and useful members of society? We doubt it: the *post hoc* and the *propter hoc* are not identical. Let us take an example. George III. was particularly desirous of a long life, and whenever he met with a very old man he cross-questioned him closely as to his habits. On collating the evidence thus obtained, it was found that the only point in common among these men was a habit of early rising. Hence His Majesty drew the inference that early rising was the cause of longevity! But if he had extended his observations he would have found that a far greater number of early risers did not reach an advanced age. The only legitimate conclusion is that early rising, when practised *voluntarily*, is a proof of unusual bodily vigour.

Very similar is the connection between drunkenness and

crime. It is probable that in countries where alcoholic drinks are in common use the majority of criminals are at the same time drunkards. But before we conclude that their drunkenness is the cause of their criminality we must first examine the state of affairs in countries where alcohol is not an ordinary beverage, or where at least it is used in much smaller proportions than in England. If we do so we shall find that murder, robbery, and the like, do not become rarer as the consumption of intoxicating liquors decreases.

Mr. McElroy, commenting on the lamentations of temperance advocates that "the demon Alcohol is yearly dragging down to dishonourable graves hundreds of thousands of the brightest and fairest of our land," replies that this is supreme nonsense. "With very few exceptions, every one who goes to perdition by the Alcohol route would reach that destination by some other highway if the Alcohol line were not running."

We often forget what a fortunate circumstance it is for Society that the majority of criminals are men of profligate habits. Were it otherwise they would be far more formidable enemies; they would live longer; their families would be less likely to die out; their plans would be more skilfully laid and executed. Should we ever have a temperate criminal class we shall encounter a danger more serious than most of us even imagine. This hazard is to be remembered when we think of rendering sobriety compulsatory by Maine Laws and Permissive Bills.

Says Mr. McElroy, "It was exceedingly unfortunate for the community that all the leaders in the James Gang were strictly temperate men. Had it not been so their career, instead of extending over twenty terrible years, would have been cut short inside of five. . . . Temperance and chastity, in a rascal of any kind, mean an immense amount of mischief to the community. Fortunately they are quite rare." Less rare, perhaps, of late than they ever were before.

But another consideration here appears. Many a man owes his rise in the world—perhaps even his opportunity for earning a livelihood—to the fact that he has been sober and steady, whilst his competitors, or, in plain English, his enemies, have been profligates or drunkards. But if we compel all men to be sober the struggle for existence will necessarily become more frantic, since a number of the combatants will no longer, as at present, be eliminated. Dr. Lees, in his celebrated prize essay on a prohibitory liquor-law, pronounces the number of men whose lives are

shortened by alcoholic beverages a loss to the community, inasmuch as "dead men pay no taxes." But neither do dead men require food and raise its price by the increased demand. Nor do they compete for employment, and reduce by such competition profits, fees, salaries, and wages.

Mr. McElroy further contends that "Whisky makes no man lazy, shiftless, dishonest, false, cowardly, or brutal. These must be original qualities with him. If he has them he will probably take to whisky,—though not inevitably,—which then does the community the splendid service of hurrying him along to destruction, and of abridging their infliction upon the public. People who have done much in the way of reforming drunkards have been astonished to find how little real manhood remained after eliminating whisky from the equation; they have supposed the manhood to be only obscured, and have been disheartened to find how frequently it happens to be demonstrated that there was never enough of it to pay for the trouble of saving the victim of intemperance."

The passage just quoted is open to the charge of exaggeration. There have undoubtedly been reclaimed drunkards who after their reform have merited well of Society. Still we think that in too many instances the drunkard, however bright or brilliant he may appear, is, on the principle that nothing is stronger than its weakest part, an imperfectly constituted individual. He may have great talents, especially the gift of expression, but he is lacking in common sense and in self-command. Hence we notice that, though the propensity to intemperance is common among poets, novelists, orators, musicians, even of a very high order, it is exceedingly rare among men of Science. A drunken investigator of Nature is almost a contradiction in terms.

Mr. Mattieu Williams and Mr. McElroy have been already denounced for their "heartless selfishness" in recognising the efficacy of vice as an agent in eliminating the worthless portion of the community and in securing room for the worthier. We are by no means certain that they deserve this taunt. Neither of them created the struggle for existence. Were population well within the limits of room, employment, and food, we have no doubt that both these authors would rejoice. But seeing that we are plunged into a struggle in which some must go down, whilst others succeed, it is surely well that triumph should be reserved, as far as possible, for the better portion of the community. It is surely remarkable that almost every "movement" of a philanthropic character has for its result, though not perhaps

for its object, the intensification of the struggle for existence. In proportion as it is successful it must render life the harder and the less worth living. It is said, by the followers of Darwin, that the struggle for existence is necessary for human improvement. We are by no means certain that such would be the case; in all cultivated animals and vegetables we stamp out this struggle. In our fields and gardens we sow only so many trees or plants as can find sufficient soil, sun, and air, thus preventing all struggles among themselves, and we extirpate as far as possible weeds and noxious animals, thus limiting, if we cannot eradicate, competition with other species; and the result justifies our wisdom. Compare the crop of an ordinary turnip field with that of what might be styled a "competition turnip field," where the roots had been let spring up, grow, and fight it out among themselves. The produce of such a field would not be one-half that of the non-competitive plot, and its finest root would not be worth exhibiting. Is it not very probable that a similar result might follow in a human society where the struggle for existence had been stamped out? No one, indeed, sees clearly how the end is to be reached, but in the meantime we are scarcely wise in working in the very opposite direction.

It may, meantime, be questioned whether every vice cuts short the days of its votaries, and leads to the extermination of their descendants. We doubt if this can be said of the inordinate covetousness of the present day. Says Mr. McElroy, "The policeman on the next corner will bear decided testimony that the number of scoundrels who survive their thirtieth year is astonishingly small." But with perhaps the most dangerous scoundrels of the day policeman *Z* 22 has nothing further to do than perhaps to touch his hat to them. The scoundrel now knows how to carry out his plans without breaking the law. He robs not by crying "Stand and deliver!" but by rigging the market. He belongs not to a gang, but to a syndicate, and when he has done more harm than a generation of bandits, burglars, or forgers, he dies in peace, and leaves his children in good positions.

No! Mr. McElroy: it is *not* demonstrable that the proportion of bad men is steadily decreasing. They have assumed a new aspect, and the statistician who should enumerate them would encounter endless actions for libel.

V. THE GLACIAL EPOCH.

By D. YEWDALL CLIFF.

IS the Glacial theory as set forth in the "Origin of Species" generally acceptable? To me it is not satisfying. The final impression left on the memory is this: that Darwin supposed the Earth's polar axis to have always been pretty much at the same inclination to the plane of its orbit as it is now, and that during the Glacial Epoch the whole Earth was at the same time clothed with ice and snow,—that the cold gradually crept down to the Equator in a "circumpolar" direction. The survival of Tropical vegetation, &c., or the crossing the Equator of the Temperate forms, is alone a very great obstacle, and his explanations are still less assuring. They were before and after, which would effectually silence any fancy as to their anterior evolution or hereditary revertance; the fossil record, incomplete though it be, tells us plainly to the contrary.

But there is another supposition, which has doubtless often been suggested before, which falls in much more naturally with Darwin's theory in general, *viz.*, that the inclination of the polar axis has varied to a far greater degree than it does at present; nay, it may positively have been situate in the plane of the Earth's orbit. *Thus there has always been a polar region*, though probably nothing like as cold as in recent geological time. I write "region" in the singular, because, as we can see, if the polar axis ever lay *in* the orbit's plane radially with the Sun, there would only be one climatic pole, and that on the side opposite to the Sun,—as the Moon in relation to Earth. This would be the nearest approach seemingly to Darwin's Glacial Epoch, and it the severest possible, extending to the present Equator; and the South Pole would be the torrid region. A more remote contingency would be solar or firmamental disturbances, before the present equilibrium was established.

With a widely, though assuredly slowly, oscillating axis, it is easy to see—as its poles travelled all over the world—they would carry in a moving patch, as it were, the Arctic flora and fauna, which would still exist where the temperature allowed,—*e.g.*, mountain-tops; whilst the patch swept on, driving the temperate (and the temperate though tro-

pical, like a shadow before) life kingdom before it, while it was followed behind by temperate, and the temperate by tropical life; thus the whole chasing one another round the world, dividing species like a ship the sea, which closes behind, spreading devastation around in the extermination of species and the denudation of the landscape, followed in its turn by a vastly newer life in respect of time, paving its way with a new formation over the land and sea.

The signs of its progress will be denuded and effaced in a "day" of Geology; it is but the latter of the last part of its last journey, that is too patent to escape our observation. It may have played a far more important part than it is credited with, and the "destruction of species," at which the modern sage so cheaply sneers, may perhaps be something more than a "myth" of the old geologists. It is perhaps within the range of possibility that these times may be astronomically ascertainable.

The more natural an explanation is the more likely it is not only to be more readily accepted, but to be true also. Yet the immensity of the question is so profound that it seems utter audacity on my part to put forward my observation, particularly in criticising a man like Darwin.

Might we not guess at the progress of the Poles? Has it not been more than once in a direction from Europe to America,—*i.e.*, was America its latest station? We know that its life-kingdoms, so to speak, are apparently behind Europe, which must mean an immensity of geological time. The longer the time the more vigorous the species resulting, the struggle for existence having full play; so that, when brought in competition with a less highly evolved series of species it is not surprising that they spread rapidly, and that the reverse seldom occurs. Thus a re-distribution of species is occasioned. Did the South Pole make its last retreat over new Zealand and Australia?

If these visitations have taken place since the islands generally were isolated, will it not explain the absence of mammals, or species of any kind, that could not cross the surrounding seas again? We might guess that, as far as the horse, &c., went, it had swept the American continents from end to end, leaving no side to escape, but driving all before it. If it be shown that there are countries where the old geological fauna and flora exist posterior to what is considered the Glacial Epoch, then this may show that it was visited at a more recent date before the last crisis in Europe. The torrid zone, of course, would always follow the Earth's equators, and fossils recently discovered show

little parity of reasoning, all who have had to receive and expend money ought to be versed in the science of Money; yet it is well known that this is not the case,—that only a very small percentage of the community have any knowledge of money as a whole; and it is equally true that only a very small percentage of the educated portion of the public are really and truly educationists.

Prof. James Bryce, M.P., in his article "The Future of English Universities," in the "Fortnightly Review" for March, refers to the prevailing opinion that anyone who has received a so-called good education is considered to be a thoroughly competent person to undertake the difficult task of improving and reforming our educational institutions and systems. He states, referring to the two University Commissions appointed, by the Act of 1877, to reform the Universities and Colleges of Oxford and Cambridge respectively, —"What have they accomplished? What has been the total result for good of their labours? They received from the Legislature, which no doubt felt its own incompetence to handle such problems, scanty and vague instructions. A large discretion was given them to settle things as they thought best. Some little power of resistance the Colleges had, but it was such as the Commissioners easily could, and often did, overbear. The credit or discredit of the work, therefore, belongs to the Commissioners. Nor, though they were appointed by a Conservative Government, can anyone say that a Liberal Government would be likely to have chosen Commissioners any better qualified for the work. *For the rule in England seems to be, with both parties, to place on a Commission not men of special capacity or knowledge, but persons generally prominent, if not eminent, such as judges and bishops, and leading members of either House of Parliament.*" Mr. Bryce's remarks have a much wider application. Not only do Governments appoint men, to improve and reform our educational institutions, who have never signalised themselves in the least in the science of Education, but they likewise—with the same indifference apparently with regard to the educational progress of the country—frequently place men in prominent positions, in our educational departments, who have never betrayed the slightest qualification for the important duties they have to undertake.

An excellent educator, like a distinguished orator, statesman, musician, or painter, is born one; he is born endowed with those necessary mental qualifications, in a marked degree, which are required for the originating of and carrying out philosophical methods of teaching. There are many

examples that those who are not endowed in a marked degree with the talents requisite for the task will not acquire them to the fullest extent by mere education; how few, for example, of all the University men who have occupied the position of a teacher in our grammar schools have distinguished themselves as educationists. The late Dr. Arnold is the one who obtained the greatest public reputation as an educator, and even he does not occupy a position in the first rank of educational philosophers. Mr. Herbert Spencer believes, and I think rightly, that true education is practicable only by a true philosopher; but that is evidently not the opinion of our Statesmen and Members of Parliament, otherwise they would never vote, year after year, the sums of money they do for a system—payment on results—which must extinguish all philosophical spirit in the teachers.

The qualifications required by both teachers and examiners are thus summed up by Mr. Herbert Spencer in his work "The Study of Sociology":—"It becomes clear," he states, "that those having supreme authority suppose, as men in general do, that the sole essential thing for a teacher or examiner is complete knowledge of that which he has to teach, or respecting which he has to examine. Whereas a co-essential thing is a knowledge of Psychology, and especially that part of Psychology which deals with the evolution of the faculties. Unless by special study, or by daily observation and quick insight, he has gained an approximately true conception of how minds perceive, and reflect, and generalise, and by what processes their ideas grow from concrete to abstract, and from simple to complex, no one is competent to give lessons that will effectually teach, or to ask questions which will effectually measure the efficiency of teaching."

The inspection of the classes under the Department and the examination of those taught in these classes are the next divisions of the Department's plan we have to consider. The inspection and examination of the National Schools under the Education Department are combined; but the two functions are not performed by the same persons in the Elementary Science Classes under the Department. Why the Lords of the Committee of Council on Education should combine inspection and examination in one set of schools, and not in the other set, is, to say the least, very singular. It is admitted by all educationists that the two functions ought to be united, and in no branch of study is the union of the two more necessary than in the examination of

students in the Inductive Sciences. By not combining the two the examiner never comes in contact with the teacher or the taught; consequently the only test he has of the work and teaching of the schools are the written examination papers. But by no written examination of any kind can it be ascertained whether the examinees have been trained and possess the mental qualifications necessary for being GOOD OBSERVERS and EXPERIMENTERS, and whether they have even acquired the necessary manipulative skill for the latter; and yet observation and experiment are the *fountains* of the Inductive Sciences,—they are the *two* sources from which springs our knowledge of Nature and its laws. As regards those of the examined who only go in for a mere written examination, all that the examiner knows about them is that they have or have not acquired the necessary amount of the names of things.

There are four Permanent Inspectors for the Science and Art Classes, and about a hundred Engineer officers are employed for occasional duty as Assistant Inspectors. Why military men should be singled out as a class to undertake the important duties of inspection would not be an unimportant question for some Member of Parliament, zealous for the educational progress of the country, to ask the Vice-President of the Education Department. It would be interesting to know whether any reasonable explanation could be assigned for these peculiar appointments. That the duty is an important one must be admitted, for good inspection will reveal more as to the kind of instruction given in a school than the mere perusal of examination papers. The inspection, as will be shown further on, costs the country yearly a considerable sum of money.

About twenty-five Professional Examiners are employed in the Science division; they are supposed to—and probably do, although it has not always been the case—set the questions, and they examine *some* of the papers; the remainder of the papers are handed on to a number of Assistant Examiners, who are or were paid so much per dozen papers they examined. This mode of payment for examining the papers must be a strong inducement to the examiner to get through them as quickly as possible; and yet the teacher's payment depends mainly, although not entirely, as we have previously pointed out, on the numbers of marks the examiner assigns to his pupils. The Principal of King's College, London, the Rev. Canon Barry, well observes in his paper, "The Good and Evil of Examination," "that there seems to be too little appreciation of the exceeding difficulty of the task

of thorough examination. Examiners are burdened with a mass of work which they cannot get through except in a perfunctory manner, and which even then so utterly wearies them out *that their faculty of judgment and comparison is lost*, and, unless they are strongly belied, are far from preserving an uniform standard in their arbitrary and irrevocable decisions." The late Prof. Augustus De Morgan held the opinion that he could judge of the merits of the competitor from the whole work, but that he could not *reckon it up in marks;* he therefore always refused to examine in that way.

In addition to the Professional Examiners and the Assistant Examiners, there are two Official Examiners. What the duties of these examiners are does not appear; they evidently do not prepare the questions, and it can scarcely be supposed they overhaul the marks the examiners have assigned to the answers in the different papers, as they are apparently not of the same scientific standing as the Professional Examiners, and besides they can scarcely be considered to be competent judges in *all* the different branches of Science which are examined upon.

Written examinations fail utterly to test attainment in any of the Inductive Sciences, as they would equally fail to test the artistic power of the painter or the sculptor; and this is known to all who are practically conversant with any one of these sciences. I have never met a chemist yet who would engage a party as his Laboratory Assistant if his sole qualification for the post was that he had passed a written examination, however severe the examination might have been; because the party requiring the Assistant would know that he could not, without practical instruction, turn any chemical information he might possess into practical power. What would be the value, for instance, of one learning, either from a book or a teacher, all the tests for arsenic? If he could not actually put in practice that information it must simply hang like dust about the brain, or dry like rain drops off the stones. Does not such useless information represent the kind of information the majority of the students acquire, in the Department's schools, of one or more of the Inductive Sciences; and from the miserable way the teachers are paid the evil is increased, as we have seen that some of them, in order to gain little more than a bare subsistence, have to teach some of those sciences of which they themselves have no practical knowledge. Then why is it that those in authority continue a system which can neither benefit the taught nor the State? Mr. Herbert Spencer supplies, in his "Sociology," a general answer:—"It

becomes," he says, "manifest that, in common with the public, those in authority assume that the goodness of education is to be tested by the quantity of knowledge acquired. Whereas it is to be much more truly tested by the capacity for using knowledge,—by the extent to which the knowledge gained has been turned into *faculty*, so as to be available both for the purposes of life and for the purposes of independent investigation. Though there is a growing consciousness that a mass of unorganised information is, after all, of little value, and that there is more value in less information well-organised, yet the significant truth is that this consciousness has not got itself officially embodied, and that our educational administration is working, and will long continue to work, in pursuance of a crude and out-worn belief."

(To be continued.)

ANALYSES OF BOOKS.

Snakes: Curiosities and Wonders of Serpent Life. By CATHERINE C. HOPLEY. London: Griffith and Farran.

A POPULAR treatise on serpents may safely be pronounced a novelty. Birds, beasts, and fishes—even insects to some extent—have an attraction for the general public, and figure accordingly to no small extent in modern literature. But reptiles, and especially serpents, are viewed, even by tolerably intelligent persons, with a vague horror. No one beyond the very limited circle of professed naturalists cares to inquire into the attributes and the habits of these creatures. To do so is, indeed, regarded by certain of the "unco' guid" as slightly profane. Accordingly we are by no means surprised at reading the following passages in Miss Hopley's introduction:—

"I learnt enough of snake nature to feel safe in proceeding with my book of 'Adventures,' and in presenting it to a publisher. 'As a gift-book no one would look at it, and as an educational work there would be no demand for it,' was its encouraging reception. . . . For the space of two years the sequel to my 'American Pets' went the round of the London publishers of juvenile works, and to several in Scotland. It was read by many of them who professed to have been extremely interested in it, but none could be persuaded to 'entertain so repulsive a subject.' One member of a publishing house, distinguished for the high standard of its literature, positively admitted, among its insurmountable objections, that when a child his mother had never permitted him to look through a certain favourite volume late in the day 'for fear the pictures of snakes in it should prevent his sleeping!' An editor of a magazine told me he should lose his subscribers if he put snakes in its pages, and another made the excuse that his children would not look at the magazine with a snake in it."

Such being the positive repugnance to instruction in this branch of Zoology, we need not wonder at the ignorance concerning serpents which prevails. We find educated people still regarding the harmless, and indeed impotent, tongue of snakes as a deadly sting. Still less can we feel surprise at the confusion that exists in their nomenclature and synonymy. We find several species, some harmless and others deadly, bearing the same name, whilst in return one and the same species figures in different countries, or even provinces, under a variety of names. We need only give as an instance our only venomous British

snake, *Pelias berus*, which in some districts is known as "adder" and in others as "viper." Waterton, in a way remarkable for an out-door naturalist, speaks of the adder and the viper as two distinct species. The viper he pronounces poisonous, whilst the adder is, with him, a "harmless little fellow, very useful in clearing the fields of mice." Possibly he gives the name adder to the grass-snake (*Tropidonotus natrix*), which, however, is much more given to prey upon frogs than mice.

Miss Hopley's object is the very laudable one of giving in a popular form a correct account of serpents, drawn as far as possible from actual observation, supplemented by reference to such modern works as Dr. Fayrer's "Thanatophidia of India," Dr. E. Nicholson's "Indian Snakes," &c.

Here it must not be forgotten that the study of living snakes may perhaps before long be practically proscribed in England. Serpents, it is well known, can only be fed on living prey. Hence our "zoophilists," who experience no qualms when eating an oyster alive, consider, *e.g.*, the reptile-house at the Zoological Gardens an outrage on their sensibilities, and, for anything we know to the contrary, as a "grievous national sin." We believe the Zoological Society has made a concession to this clamour by causing the serpents to be fed only at night.

Miss Hopley makes a passing reference to the "benevolent organs," and rationally enough defines "cruelty" as unnecessary torture. Among the questions here discussed we find "Do snakes drink?" with an answer in the affirmative. We never had the good fortune to see a snake drink when in a state of freedom. We know, too, that many species haunt parched localities, where moisture in other shape than that of dew and occasional rain-drops is not too plentiful. But the observations brought forward by Miss Hopley seem perfectly conclusive. Perhaps, however, all species of serpents may not be alike in their fondness for liquids.

The relish for birds' eggs displayed by some snakes is an indisputable fact, greatly to the annoyance of farmers' wives in warm climates, where the poultry yard is often plundered on the large scale. Milk is also very attractive to the cobra and other species. Perhaps these two propensities might be turned to account for reducing the number of certain snakes by leaving poisoned milk and eggs (the latter marked) where they might be swallowed by these marauders.

The "Snakes of Fiction and of Fact" is the title of a very interesting chapter. Here mention is appropriately made of a lecture on "Snakes" given at the London Institution in March, 1880, which, as our authoress tells us, was "artistic, poetic, figurative, imaginative, but not zoological."

The hybernation of reptiles and the opposite stage of æstivation observed in some very dry and hot countries are fully and correctly described, but, as there are here no erroneous notions

to expose, the subject calls for no discussion. A curious phenomenon of kindred nature has been recorded by Dr. Cantor. The sea-snakes of the Eastern Ocean (Hydrophidæ) are sometimes found so soundly asleep on the surface of the water that they are not aroused by a ship passing among them.

In connection with hybernation, the authoress mentions some cases of large numbers of snakes which had collected together under manure-heaps, &c., for the purpose of passing the cold season. We have more than once found large heaps of the eggs of snakes—far greater in quantity than could be deposited by any ten females of the species in the district—amongst decaying leaves and other vegetable refuse. We do not find in the work before us any notice of the alleged mass meetings of snakes which are said to have been observed in warm weather, both in the Eastern and the Western Hemispheres.

The chapter entitled "The Tail of a Snake" contains mention of some curious notions held in former ages. It was supposed that several serpents—such as the horn-snake of Virginia, described by Lawson—are armed, in addition to their poison fangs, with a sting at the end of the tail. It was said that if the sting was by chance struck into the bark of a young tree, the tree instantly withered.

In such a work as the one before us the "Great Sea-Serpent"—to some people a name for any and every thing fictitious—cannot be wanting. Like most writers who have given the subject a candid examination, Miss Hopley inclines to the belief in the existence of huge marine ophidians. There is some amount of direct evidence in the affirmative, *e.g.*, the case of the *Pauline*, whilst the only negative evidence—the non-occurrence, as far as has been observed, of vertebræ and other remains of such huge serpents—has been invalidated by a recently recorded fact. An American vessel, engaged in a dredging expedition, succeeded in bringing up from the bottom no relic of human or other vertebrate life, save an india-rubber doll; yet the region explored was one where sharks, dolphins, &c., abound, and where many shipwrecks have happened. Hence it is fair to infer that the skeletons of animals which perish in the sea are, as a rule, rapidly disintegrated. Thus we have small grounds for wondering that no remains of any giant ophidian have hitherto been dredged up.

The chapter on the "Venoms and their Remedies" embodies the modern views based on the researches of Fayrer, Nicholson, &c. The difference of kind between the secretions of different species is recognised; but the great question, whether the active principle in any case is a ferment or a definite chemical compound, is not discussed. It is asserted that "the blood of an animal killed by a bite, if injected into the veins of another animal kills that also. But is the proportion of blood thus injected as small as that of the original poison, and is death brought on in the same manner and with the same symptoms?

Incidentally we notice some incidents sadly out of harmony with Waterton's assertion that serpents never take the offensive or pursue a foe.

Concerning the question "Do snakes afford a refuge to their young?" Miss Hopley gives an answer in the affirmative.

Bringing our short notice of this volume to a close, we must say that it has given us no small pleasure. We believe that, if read as it deserves, it will dispel some groundless prejudices and correct not a few obstinate errors.

The Micrographic Dictionary. A Guide to the Examination and Investigation of the Structure and Nature of Microscopic Objects. By J. W. GRIFFITH, M.D., &c., and ARTHUR HENFREY, F.R.S., F.L.S., &c. Fourth Edition. Edited by J. W. GRIFFITH, M.D., &c., assisted by Rev. M. J. BERKELEY, M.A., F.L.S., and T. RUPERT JONES, F.R.S., F.G.S. Pp. 829. 53 Plates, 818 Woodcuts. Two vols. London: John Van Voorst. 1883.

A NOTICE of a portion of the above work has already appeared in a previous number of this Journal. Its completion enables a further analysis to be given. As was anticipated, the book is a great improvement on the last and former editions, not only from its enlargement, but also from the careful manner in which the information has in most instances been brought as close to the date of publication as possible.

Owing to the form of issue in parts, in which the plates and their explanations, and the introduction, appeared irregularly, little could be said of the work in the former review, founded on the perusal of only a small portion.

The Introduction retains its accustomed form and place: alterations and additions have in general been made in accordance with the advance that has taken place since the issue of the last edition.

In treating of the stage of the microscope it is a singular omission that no mention should be made of the concentric rotating stage, which, owing to the advocacy of Dr. Carpenter and the keen competition among opticians, is now applied to many of the cheaper forms of microscope as well as the larger instruments, and adds greatly to their utility in permitting objects to be examined with great facility under illumination, in extremely varying directions.

The remarks on object-glasses are good, and notice is taken of the important work done with high powers and immersion

objectives: the reason of their superiority is explained in the article "Angular Aperture."

The distinction between water and oil immersion lenses seems to have escaped notice: the latter or homogeneous system, originally devised by Mr. J. W. Stephenson, to save the trouble and uncertainty involved in adjusting for the thickness of the cover-glass, and afterwards shown by Prof. Abbe to possess additional valuable properties, chiefly aperture, far beyond the limit of glasses working through air or water, and that precious quality to the working microscopist, increased working distance.

The description of the Achromatic Condenser, good as it is, would have been much improved by the mention of the illuminators constructed on the immersion principle, rendered necessary by the employment of immersion objectives, as, if a condenser working through air is used with an immersion-glass, its aperture is reduced to 1·0 numerical aperture = 180° in air. So to obtain the full benefit of the augmented aperture, the condenser must be adapted to transmit its pencil through the same medium as that of the objective. Such illuminators have been designed by Abbe, Stephenson, Powell and Lealand, and others.

The concluding portion is occupied by practical directions for the use of the microscope, and carrying on observations by its means, and mounting and preparing objects.

With respect to the Dictionary proper, a considerable extension is apparent when compared with the previous editions. The student is much assisted in finding what he requires by an extensive series of cross-references, and those who wish to extend their reading will find all they require in the copious list of books and papers at the end of each article. A short quotation will afford the best illustration:—

"Illumination.—This has been specially alluded to in the Introduction (p. xxviii.), and in the articles 'Angular Aperture,' 'Diatomaceæ,' 'Polarisation,' and 'Test-objects.' But several papers have been published in recent years, describing new and ingenious methods of illuminating the finer and more difficult objects, to which we can only refer.

"Bibl.—Higgins, *Qu. Mi. Jn.*, x., 150; Abbe, *M. M. Jn.*, xiii., 77; Smith, *ib.*, 88; Wenham, *ib.*, 156, and *Engl. Mechanic*, 1877, 279; Whittell, *ib.*, xiv., 109; Bramhall, *ib.*, xvi., 102; Osborne, *ib.*, xvii., 179; Moorehouse, *ib.*, xviii., 29; Woodward, *ib.*, xviii., 61; Edmunds, *ib.*, xviii., 78; Schulze, *Jn. Mic. Soc.*, 1878, 45."

The treatise "Rocks," by Mr. Frank Rutley, is a valuable addition, and is accompanied by Plate 42, containing twenty-four coloured figures of mineral sections viewed by polarised light. Much practical information is given as to the peculiar mode of observation required in examining mineral structures. Here the

polariscope does most important work, and is used in a much more delicate manner than is usual with the generality of observers. A new field of research is now open to the microscopist and geologist. The figures on the plate certainly show that textures hitherto considered homogeneous, owing to the neglect of suitable means of observation, possess a vast amount of structural detail. These discoveries have resulted in the formation of that branch of Mineralogy known as "Petrology," which bears the same relation to Geology as Histology to Biology in general.

The Plates are interleaved with very full explanations, which can easily be utilised for the purpose of reading the book by its illustrations, and referring from them to the text, as may be required, a method suggested and carried out very perfectly by Dr. Beale, in his "How to Work with the Microscope." Plate 2 will be found very useful, as it contains figures illustrating some of the more common forms of adulteration.

The book can be strongly recommended to those students who wish to learn, as for those who wish only to pass manuals are legion.

Darwin and Modern Evolution. An Address delivered to the Essex Field Club, January 27th, 1880. By RAPHAEL MELDOLA, F.R.A.S., F.C.S., &c., Retiring President.

CONCERNING the former, or what might be called the business portion of this interesting address, we need say little beyond expressing our satisfaction at the progress of the Essex Field Club, and at the work it is evidently doing. This work is of a two-fold nature, it is concentrating and systematizing the labours of local geologists, botanists, entomologists, archæologists, &c., many of whose observations might otherwise fail to be recorded; and it provides an organization for defending the interests of Science, whenever needed. We have had very recently proof that the lovers of Nature, if once organized, form a power which the authorities, local and national, will have in future to take into account. We only hope that other similar bodies throughout the realm may exert themselves as successfully as the Essex Field Club has done, under the able and zealous guidance of its late President, and that all may co-operate whenever there is any good end to be secured, or any threatened evil to be warded off.

Turning to the more general part of the address, it must be admitted that the life and work of Charles Darwin form no easy subject to handle. So much has he, especially during the last twelve months, occupied the attention of the intellectual world,

that little can be said concerning him which has not been to some extent anticipated. We have, therefore, the greater pleasure in recognising in Mr. Meldola's "Address" certain points which may usefully engage our attention. He accentuates especially the fact that Darwin was "a field naturalist as distinguished from a museum naturalist,"—in fact, a magnified and intensified type of the class of whom Gilbert White was one of the earlier representatives. Experiment and observation were his very life, living plants and animals were always appealed to if possible. We must here quote a suggestive note of the author's :—"The difficulties besetting the experimental investigator are forcibly recalled to my mind by a remark once made to me by Mr. Darwin. Speaking on this subject, I said that Nature when thus questioned often gives an evasive answer, to which he replied, 'She will tell you a direct lie if she can.'" Such being the state of the case we have need of all methods of research, direct and indirect, of experiment and observation modified in every conceivable way, that the one may check the other. Whoever, therefore, would deprive us of any one method seeks to cripple, if not to arrest, our progress. It is idle for him to say that other methods yet remain to us. We cannot fly with one wing; we want both.

Passing from these considerations, the bearing of which can scarcely be misinterpreted, we come to a very just remark. Mr. Meldola declares it surprising how much the Darwinian theory is still misunderstood by the general public. "Ask any non-scientific person what he imagines to be conveyed by the word Darwinism, and he will probably tell you that it is the theory that man is descended from a monkey, which is about as explicit as saying that the Newtonian theory of gravitation is something to do with an apple." Nay, as he goes on to show, there are many extreme specialists in Science who vaguely accept the Evolution theory in words, and yet have no conception of its practical importance. It is with them a dead formula to which they bow, not a principle animating their studies. These misconceptions—or rather misrepresentations—Mr. Meldola combats with a clearness calculated to ensure conviction. The Address before us, brief as it necessarily is, may be safely recommended as a preliminary study for outsiders who wish to know for themselves what Darwinism really is, before attacking longer and more elaborate treatises.

Proceedings of the Scientific Association of Trinidad. Part XII. December, 1881. Port of Spain: J. Wulff. London: Trübner and Co.

We are exceedingly glad to find that a Scientific Association has been established in Trinidad and has got fairly to work. The locality is exceedingly favourable for research in many branches of biology. Situate as it is at the extreme verge of the Brazilian subregion of the great Neotropical Region it forms a connecting link to the Antillian subregion, and its birds, reptiles, insects, and mollusks offer to the animal geographer a most interesting field of study. The aquatic fauna of its shores has also not yet been studied with the needful thoroughness. The kind of work that that can be done by the mere collector, whether by land or by sea, has been to a great extent accomplished, at least as far as the more showy species are concerned. But the more important subjects of the development, the life-history, and the habits of a fauna can be worked out only by the resident. We should like to see in all the British colonies individuals, or better still societies, who are like, *e.g.*, Dr. Fritz Müller in South Brazil, making a close investigation of their respective districts.

The coast of Trinidad would, it seems to us, offer an excellent position for an aquarium. We mean, of course, not a place of random amusement like some of the establishments which have sprung up in England, but of honest experiment and research, like that of Naples, or the one which is just being inaugurated on the coast of New South Wales.

The "Proceedings" before us contain a paper by R. J. Lechmere Guppy, F.L.S., on the Land Shells of St. Vincent. During a stay of three weeks the author took sixteen species, of which six are common to the islands north of St. Vincent, seven to Grenada, seven to Trinidad, and five to the mainland of South America. Only three species are common to all these five localities. Mr. Guppy states that land shells are much scarcer in St. Vincent than in Grenada and Dominica, and others of the Antilles.

The same author also contributes a paper on the "Recent and Tertiary Species of *Leda* and *Nucula* found in the West Indies, with Notices of West Indian Shells."

Mr. Guppy has also communicated a description of a Heterocereal Fish found in the Blue Limestone of the Laventille Hills, on the east of Port of Spain, for which he proposes the name *Acanthodes elongatus*. He has read also a memoir on the fossil Echinodermata of the West Indies, of which he notices twenty-six species.

Might we express a hope that the Scientific Association of Trinidad will use its influence with the Government and the

public to obtain some protection for birds similar to that which prevails in Demerara?

Magnetism. By THOMAS P. TREGLOHAN. London: Longmans and Co.

THIS work is a fair average specimen of the Science-Manuals in which the press of England is so exceptionally fruitful. The author tells us in his Preface that the work has been written "to supply a want long felt by students who are preparing for examination in the Elementary Stage of the Science and Art Department, so that the subject may be simplified and their studies facilitated by treating it under the divisions laid down in the Syllabus of the Department." In other words, it is written with the primary object of enabling intending examinees to to "pass" the fashionable ordeal. As an Appendix follow the "Science and Art Department Questions in Magnetism" from the years 1867 to 1882 inclusive. Skilful "coaches" will of course be able to calculate the chances of the recurrence of any of these questions, and can "prepare" their clients accordingly.

In connection with this subject we cannot help referring to a most able article on "Brain-power in Education," which appeared not very long ago. The author contends and shows that examinations, competitive or otherwise, are no tests of brain-power. They test, if anything, the relative skill of those who train the candidates. He mentions an instance where, without any collusion, seven out of the thirteen questions actually occurring in an examination paper had been predicted as due by an experienced "coach," and his pupils had been drilled accordingly. A well-stored mind is by no means necessarily a suggestive mind, capable of dealing rightly with unforeseen emergencies. The writer is even heretical enough to say that "if we required an accurate test of brain-power we should be far more likely to obtain correct results by an examination in whist than we should by an examination in mathematics." He further remarks, most truthfully, "The mere routine man will almost invariably bring about a disaster when he has novel conditions to deal with, and as a rule the routine youth comes out best at an examination."

Victorian Year-Book for 1881-2. By H. Heylyn Hayter. Melbourne: J. Ferres and G. Robertson. London: G. Robertson.

We have here an extensive collection of information, statistical, historical, and topographical, most of which, however, will have but little attraction for our readers.

In the remarks on the population of the colony it may perhaps be noted, as a satisfactory feature, that whilst the British subjects have increased by 19·78 per cent the proportion of aliens has been reduced by 17·42 per cent, during the ten years from 1871 to 1881. The number of Chinese, who nowhere seem to amalgamate with an Aryan people, has fallen by 33·93, or more than one-third. The colony may be congratulated on the absence of any appreciable negro or negroid element, which, wherever existing, appears to be a source of danger.

The religious census of 1881 disclosed the existence of 151 distinct denominations. Amongst these we find one Positivist, one Iconoclast (!), and three worthies who state their creed to be £. *s. d.*, and whose sincerity at least will not be called in question. The excess of births over deaths in the entire group of Australian colonies is remarkably high, ranging from 228 per cent in New Zealand to 87 in Tasmania, numbers which appear the more striking when it is added that the excess in Europe varies from 59 per cent in Scotland to 8 per cent in France. The average death-rate varies from 12·38 per 1000 in New Zealand to 17·86 in Queensland, that of England and Wales being 21·7. The mortality from phthisis is relatively much lower than in England, but appears to be increasing, which is a very sore subject in Melbourne.

Snake-bites are recorded as having occasioned five deaths in Victoria in the year 1881,—a fact which shows that there is room for the services of the mungus and the secretary-hawk.

The criminal statistics present certain remarkable features: thus whilst only 12 per 1000 of native Victorians, and 29 per 1000 natives of the other Australian colonies, of persons born in England and Wales 43 were arrested, of Scotchmen 44, Irishmen 86, but of Chinese only 20 per 1000.

CORRESPONDENCE.

*** The Editor does not hold himself responsible for statements of facts or opinions expressed in Correspondence, or in Articles bearing the signature of their respective authors.

DO SNAKES SWALLOW THEIR YOUNG?

To the Editor of the Journal of Science.

Sir,—In the "Standard" of March 5th I find the following with reference to Miss Catherine C. Hopley's book on "Snakes," just published:—"We are rather glad to find that she believes in serpents swallowing their young for protection, and she has some very curious reflections on the subject which might be pursued further." And "Land and Water" of February 24th, in speaking of it as a "vexed question," said—"We are inclined to agree with Miss Hopley. We are aware that some high authorities still look upon the case as not yet satisfactorily proved. We hope the evidence brought forward in Chapter XXVII. will set a fresh number of observers on the alert, and that the fact of ophidian mothers continuing their care over their baby offspring may be made clear to all."

I thought that I had settled this question in "Contributions to Natural History, &c.," published at Edinburgh in 1875, and again with an Appendix in 1880. It would have been interesting if "Land and Water" had told us who the "high authorities" are that "still look upon the case as not yet satisfactorily proved," and of the kind of evidence they want; and why other observations should be made and printed, while mine—which are so minute, so scientific, and I think so conclusive—should be treated as if they had no existence." On that head I wrote in "Contributions, &c.," as follows:—

"A scientific or even common-sense naturalist will not necessarily stoop so low as to demand ocular proof of snakes swallowing their young. He ascertains that *vipers* pass their young with a covering on them,—the original egg attenuated to the last degree,—which breaks as it leaves the mother, or immediately after it touches the ground; and are killed with young inside of them, sometimes upwards of 7 inches long, and divested of a covering; and he concludes at once that the young were swallowed. And his opinion is confirmed by the fact of *oviparous*

snakes being killed with young inside of them that were hatched in the soil, which proves beyond doubt that they must have been swallowed. Ocular testimony confirms the opinion, in *both* instances, that the young were swallowed" (p. 195).

The only point to be settled, so that it "may be made clear to all," I have alluded to as follows:—

"I consider the testimony so complete that nothing could be added to it, although it would be very interesting to have a careful examination of the anatomy of the snake to ascertain the physical peculiarities connected with the phenomenon described" (p. 3). I am not aware of the throat of a snake having been examined to see whether it could allow an instant passage for her young. There is nothing to justify us in supposing it could not, especially at the time nature calls for it. If a throat were examined, it should be that of a snake that was alleged or supposed to have swallowed her progeny" (p. 26). "It has often occurred to me that the female snake must have two throats,—one for ordinary purposes, and the other to give a passage to her young; or one throat for a certain length leading by a valve, as it were, to another that enters the chamber that contained the eggs, and which doubtless becomes the receptacle of the young when hatched. It will be difficult to find this passage unless when it is in use, for it will become so contracted at other times as to escape any observation that is not very minutely made" (p. 36). "The next thing to be considered is the anatomy of the snake immediately after the birth of her progeny; but that could not be so easily ascertained as that she swallows them" (p. 39).

White of Selborne's definition of the phenomenon alluded to, *viz.*, that the viper "opens her mouth and admits her helpless young down her throat on sudden surprises," is more correct than the shorter one, "swallowing," in common use. The conclusion which I drew from my researches on this subject, and which I have not seen controverted, was the following:—

"Besides *vipers* swallowing their young, I repeat what I have said in the work (p. 29), 'I lay it down as an axiom that we must hold that *all* snakes (when living in a state of nature) swallow their young, till the opposite can be proved of any particular species of them'" (p. 198).

It has often surprised me that so simple a question as this should have been considered a "vexed" one, in the case of such common-placed animals as vipers, or snakes of any kind, and that it has not been "settled" within a century after being prominently brought into notice by White of Selborne, when it should have been decided in "three minutes by the clock" on the evidence so elaborately furnished by me. I notice, from "Land and Water," that Miss Hopley prepared her book from attendance at the Zoological Gardens and a visit to America, and from writers on the subject from whom she has "quoted co-

piously." Not having yet seen her work I do not know whether she has made any reference to the two issues of mine. However I have sent her a copy of it, in case she has not seen it, so that she may make a use of it if her volume appears as a second edition. In my "Reminiscences of Childhood at Inverkeithing" (p. 59) I said that I had submitted all the evidence on "the viper swallowing her young" to the publishers of the "Encyclopædia Britannica," in December, 1881. On that occasion I wrote as follows:—"In the last edition the subject was not noticed. . . . In the forthcoming article on the Reptilia the question it is hoped will be settled 'once for all,' so that it may never again come up for discussion. If it is again omitted, the article will have left out what might be said to be 'the most interesting trait in the snake family.'"—I am, &c.,

JAMES SIMSON.

New York (P. O. Box 2887)
March 21, 1883.

THE BRAIN THEORY OF MIND AND MATTER.

To the Editor of the Journal of Science.

SIR,—Should any of your readers who are interested in the "Brain Theory of Mind and Matter" care to examine the framework of propositions on which is based the argument adopted in a paper on that subject which appeared in your issue for March last, I venture to draw their attention to three of these propositions:—

I. "All the perceptions" of man "have a merely subjective existence."

This the Authoress of the paper in question sets forth as her major premiss, remarking that it is one which "no one has ever been able to deny, though many have fancied that they were denying or confuting" it.

Here it is convenient to note that the minor premiss, "The Brain is a perception of man," leads us to the conclusion that "the Brain is subjective."

Let "Perceptions of man" = P
"Subjective" = S
And "Brain" = B,

And we have—

All P's are S,
B is a P,
∴ B is S.

II. Our Authoress *rejects* "that Absolute Idealism which will deny the existence of aught that is corporeal, even of the sensifacient hemispheres (B) and of the sensiferous nerves."

But to deny the existence of the sensifacient hemispheres and of the sensiferous nerves is to assert their subjectivity, and therefore Absolute Idealism asserts that B is S.

Now we have already seen that from the proposition all P's are S, to come to the conclusion that all B's are S is unavoidable, and at this conclusion Absolute Idealism arrives.

Our Authoress, in confessedly "rejecting that Absolute Idealism" which she "by no means adopts," proves that it is that part of Absolute Idealism that asserts that B is S which she rejects, by the admission that (III.) she is "forced to accept" a "Relative Idealism, which declares that the only Cosmos known to man is manufactured in his own brain-cells," while she maintains that the "real existence of matter" (Cosmos) "can be denied only by a metaphysical quibble." Now this admittedly *real* existence she declares to be manufactured in the brain-cells, which must therefore, as the cause of reality, be also themselves "real," *i.e.*, non-subjective, which is equivalent to the assertion that matter and its manufactory, the brain, are not subjective,—that B is not S.

But granting her own proposition, that all P's are S and that B is a P, we have found them to lead to the inevitable conclusion that B is S, which we now see our Authoress denies; but she herself admits that all P's are S, and since B is P, and "B is not S," our Authoress denies what she asserts, *viz.*, that all P's are S.

We are therefore driven to the conclusion that the framework of the argument in favour of "Hylo-Idealism," or the "Brain Theory of Mind and Matter," which "contends for identity of Object and Subject, of Ego and of Non-Ego, also contends for identity of Yes and No, of Sense and of Non-sense.—I am, &c.,

T. P. L.

THE WILL OF ANIMALS.

To the Editor of the Journal of Science.

SIR,—Noting the paragraph in the "Journal of Science" for April to the effect—"If the human will can produce effects without the intervention of bodily organs, why may not the will of other animals do likewise?"

Some people may be sceptical of this statement, and being somewhat interested in the subject would be glad to learn what demonstrative evidence there is of it, whether described in your Journal or in any other. Does it refer to the article relating to the experiments of Mr. Bishop with Dr. G. M. Beard (July, 1882, Ser. 3, p. 407)?

I am particularly anxious to learn whether there is any other statement referred to; the note in question is so meagre in its details.—I am, &c.,

T. NETTLEFOLD.

[We had no intention, in the passage referred to by our correspondent, of expressing a conviction that the human will can produce direct effects either upon other animated beings or upon inanimate matter. Our own observations have led to a negative result. But we are well aware that the question is now attracting much attention, and that there are eminent authorities who have come to an affirmative conclusion. We did not refer in any special manner to the experiments of Mr. Bishop or of Dr. Beard. Evidence bearing on the subject is to be found in the "Journal of Science" for 1881, pp. 87, 151, and 561. We may also refer our Correspondent to a Lecture which has recently been delivered before the Maidstone Natural History Society, by Dr. Monckton, and to the "Proceedings of the Society for Psychical Research. —ED. J. S.]

REPLY TO MR. W. BRAYSHAW.

IF you are a *bona fide* student of Science we think you will find the cultivation of the power of observation more important than that of memory. Note down, of course, the particulars of all your observations and experiments, and keep your reading available by the use of Todd's "Students' Index." If, however, you are merely preparing for some examination you may find the "System of Memory," of which you speak, serviceable.

NOTES.

HERR HANS GADOW, in a memoir on the colours of feathers ("Proc. Zool. Soc.") divides them into three classes:—

1. Objective, chemical colours, due to a black, brown, red, orange, or yellow pigment.

2. Objective colours depending on structure. The feathers may either contain (*a*) no pigment, and the colour depends entirely on structure,—*e.g.*, white, and sometimes yellow,—or (*b*) the feather contains a yellow or brown pigment, and the green, blue, or violet colour is produced by a peculiar transparent layer between the pigment and the surface. Of the non-iridescent colours blue and violet always depend upon structure. Green is derived from the refraction of a yellow pigment. Green pigments have been found very exceptionally.

3. The iridescent colours are produced by transparent sheaths which act like prisms.

According to M. Meyer the colour of distilled water, if viewed in a horizontal glass tube 7 metres in length, is of an intense blue by daylight, but by gaslight of a green.

M. Pasteur has studied the pneumo-enteritis of pigs, which has carried off during the last year more than 20,000 swine in the Valley of the Rhone. He traces the affection to microbia, much smaller than the bacilli detected by Dr. Klein.

According to the "Gazette Hebdomadaire de Medecine" a man living at Cuantla, in Mexico, is suffering from an anomalous disease in which the skin falls off in large patches. His sister died lately from the same affection. The malady is locally attributed to the circumstance that their mother ate largely of the flesh of the rattlesnake.

It appears that Leonardo de Vinci studied the transmission of sound, and observed that if the bell of a trumpet was immersed in the water of a lake, and the ear applied to the mouthpiece, the noise of boats sailing at a great distance could be distinctly heard.

Dr. F. L. Oswald ("Popular Science Monthly") contends, in opposition to Buckle, that fanaticism is not the result but the cause of ignorance.

According to M. Ch. Montigny ("Bulletin de l'Academie Roy. Belgique") the twinkling of the stars is much intensified during

the appearance of the northern lights—those especially in the northern region of the skies.

H. G. Baur ("Morpholog. Jahrbuch," viii., p. 417) has undertaked a special study of the tarsi of birds and deinosaurians, and finds that this part in embryonal birds is closely similar to that of the deinosaurians, a fact which renders it extremely probable that the latter are the progenitors of birds.

According to the "Scientific Proceedings of the Ohio Mechanics' Institute" the average weight of man at Boston is 154·02 lbs.; that of woman 130·87 lbs. In Kentucky—men, 158·43 lbs.; women, 133·52 lbs.

According to "Der Techniker" a Breslau hotel is now lighted up with gas distilled from human excrement. Should there occur in the gas-fittings a *hiatus valde deflendus*, and a consequent escape,—what then?

Mr. Jabez Hogg ("Medical Press and Circular") states that he has observed myriads of living bacteria in water filtered through spongy iron.

According to the "Medical Times and Gazette" the deplorable custom of making the Lord Rectorship of Scottish Universities a political question still continues. For Edinburgh the "Liberal" candidates are Earls Granville, Rosebery, and Selborne, Viscount Sherbrooke, Mr. Trevelyan, and Mr. Campbell-Bannerman, whilst the "Conservative" nominee is the Duke of Albany—all, in our opinion, unsuitable.

Our attention has been drawn to a biographical sketch of Prof. Ernst Haeckel, which Dr. E. B. Aveling contributes to the "National Reformer." Curiously enough Haeckel has been—of course accidentally—ignored by "Men of the Time," and other English authorities, on the lives of eminent contemporary characters.

The same journal, in comment upon the experiments of Mr. C. Lloyd Morgan, remarks:—"The defence for vivisection is that by means of it, all animals, including man, are saved from disease and pain." This defence we must repudiate altogether, since it merely covers experiments made for direct medical purposes, and leaves purely biological experimentation out in the cold. *Our* defence—though we pass no opinion upon Mr. Morgan's experiments—is that if it be permissible to inflict pain and death for any purpose whatever, this may be done for the sake of discovery.

Messrs. Irving Bishop and "Stuart Cumberland," the thought-readers, are quarrelling in face of the public, and putting questions as to each other's antecedents.

A writer in "Light" records an instance of the spirit of a

canary appearing, invisible to man, but visible to another canary, which learnt the song of the visitant. We have always held that the evidence for the immortality of the lower animals is substantially the same as that for the immortality of man.)

The Rev. O. Fisher ("Geological Magazine") argues that if the interior of the earth be as rigid as glass or steel, the crust must be more rigid than glass or steel, which is a *reductio ad absurdum*.

At a meeting of the Philadelphia Academy of Natural Sciences ("American Naturalist") Mr. Mehan exhibited a nest of *Chætura pelasgia*, made of cherry twigs fastened with gum, and suggested that the gum was cherry gum, and not, as stated by Audubon, the saliva of the bird.

Professor Nordenskiold, during his Arctic expeditions, was struck with the great rarity of recent animal remains. He states that in Spitzbergen it is easier to find vertebræ of extinct reptiles than the bones of the seals and sea-fowl of the present day. (The rarity of the remains of birds, small mammals, and reptiles in all countries is difficult to account for.)

"Medicus," writing in the "Truth-seeker," complains that about a year ago an eminent and highly-qualified candidate for the Chair of Physiology in the University of Michigan, was warned that he must not teach the "development theory." (Academical freedom will always remain a myth as long as the heads of colleges are LL.D.'s and D.D.'s, classical scholars, theologians, historians, and, in general, men of words.)

We much regret to announce the unexpected and premature death of Dr. G. M. Beard, of New York, a highly valued contributor to the "Journal of Science." His decease took place on January 23.

MM. Oliver and Richet ("Comptes Rendus") have discovered microbia,—chiefly bacilli,—in the blood and lymph of all the species of fishes which they have examined.

Mr. G. T. Rope ("Zoologist") notices that, in Normandy, toads are often affected with a disease which begins in the nose, and gradually eats away a considerable part of the head, the cavity being full of maggots. (Are not the maggots the cause of the disease?)

M. Beaunis ("Comptes Rendus") has measured the time required for the perception of olfactory sensations, and finds it vary from 37 hundredths of a second in case of ammonia to 67 hundredths in phenol. Olfactory sensations are perceived less rapidly than those of sight, hearing, or touch.

Professor Goltz concludes from his researches that the theory of circumscribed portions of the cortical substance of the brain,

subserving especial functions, cannot be maintained. Intelligence, sentiment, the passions, and the natural appetites, are not localised in portions of cortical substance capable of acting separately. The limited destruction of any part whatsoever of the cortical substance is unable to paralyse the action of a muscle in a permanent manner, or to withdraw it from the action of the will.

Herr J. Kühn describes a half-breed, between a Gayal bull from Further India and a cow of the long-horned African race common in the Soudan.

Mr. H. C. Hovey ("American Naturalist") records the case of a cat which had become completely blind from cataract, but which is still a capital mouser, and succeeds in finding its way home from a distance, even when the ground is covered with snow.

M. Timiriazeff, in a study on chlorophyll ("Comptes Rendus"), notes that the position of maximum energy, as fixed by Mr. Langley in the orange ray, corresponds precisely to the characteristic band of chlorophyll (between B and C). Chlorophyll seems able to convert into work 40 per cent of the energy absorbed.

M. de Chardonnet ("Comptes Rendus") has studied the penetration of the solar radiations in the eye of man and of the vertebrate animals. He proposes the law that no medium of the eye in the vertebrates is transparent for waves shorter than T or U, the limits of the ultra-violet solar spectrum. The vitreous body presents a mere trace of fluorescence in the sparrow-hawk; the fluorescence of the cornea appears in the owl and the carp, the cat, and the sheep. The crystalline lens is generally fluorescent.

Dr. J. Blake, in a communication to the Academy of Sciences, combats the view of M. Rabuteau, that the toxic power of metals is simply proportional to their atomic weight, and shows that this merely holds good in one and the same isomorphous group.

Herr Ludwig ("Botan. Central-Blatt") has shown that under certain circumstances *Agaricus tuberosus* is distinctly phosphorescent.

Herr Röhmann ("Pflüger's Archiv. Phys.," xxix., p. 509) has proved experimentally that so long as the nutriment is normal the intestinal canal can perform the functions necessary for the preservation of the organism, even in the absence of bile. The phenomena of putrefaction noticed by earlier observers occur only when the diet contains fat in abnormal quantities.

M. Dareste ("Comptes Rendus") confirms his former result that the longer the interval between the laying of an egg and the beginning of incubation the greater the probability of the

development of a monster. The change, however, is much more rapid in summer than in winter.

According to Balduino Bocci ("Central-Blatt Med. Wissenschaft"), human urine injected under the skin of frogs occasions paralysis, and sometimes even death. Upon mammalia the poisonous action is slight.

The Revs. V. G. McNally and E. H. Sugden, B.A. ("Light"), assert that the power of thought-reading is practically universal.

The "writers of the Perfect Way" ("Light") consider that "a knowledge of the physical is an indispensable aid to the comprehension of the metaphysical." This admission will appear significant to anyone who examines the physical teachings of that modest volume.

M. A. Gaudry, in a communication to the Academy of Sciences, considers that in the Silurian epoch the majority of the animals appear to have been better organised for defence than for attack. He points out that each of the epochs of the globe has had forms which reached in it their highest development, and then passed away, whilst less powerful types have proved permanent. (This is, in fact, Mr. Cope's "doctrine of the non-specialised.")

Dr. Haldemann reports, in the "Cincinnati Lancet" and the "Popular Science Monthly," that the brain of a mulatto, who died lately at Columbus, Ohio, weighed 68¾ ozs., or nearly 5 ozs. more than that of Cuvier. The man was "illiterate and not very intelligent."

The "Popular Science Monthly" mentions also the case of a bricklayer, whose brain weighed 67 ozs., but who could neither read nor write.

According to the "Amtsblatt des Landes Kulturrathes für Bœkman," the frequency of thunderstorms decreases inversely as the latitude, and from the centre of continents towards the coast. The numbers given are:—On the equator almost daily; Java, 97 yearly; Sumatra, 86; India, 56; Georgia, 55; Borneo, 54; Gold Coast, 52; Italy, 38; Antilles, 36; Lower Guinea, 32; La Plata, Canada, and Austria, 23; Baden, Wurtemberg, and Hungary, 22; Silesia, Belgium, and Bavaria, 21; Holland, 18: Saxony, Brandenburg, and Kasan, 17; France, Australia, and South Russia, 16; Spain and Portugal, 15; Slesvic Holstein, Mecklenburg, Hanover, West Prussia, and Cape Town, 13; Mesopotamia, 12; North Russia, 10; Sweden and Finland, 8; England, Astrabad, and the Alps, 7; Norway, 4; Cairo, 3; Egypt (Upper?), and Turkestan, scarcely any.

The Hygienic Congress of Geneva offers a prize of 2000 francs for the best essay on the causes and prevention of blindness,

The Bill for the total abolition of physiological experimentation introduced into the House of Commons by the Bestiarians, was simply "talked out." It is particularly gratifying to find that the Home Secretary could see no reason for increasing the stringency of the existing law. The public seem recovering from the "anti-vivisection" mania, and if the medical profession and men of Science generally do not relapse into carelessness, there is room to hope that the agitation may subside, and that its agents may have to seek some more useful method of earning a livelihood.

A. W. S., writing on Kangaroo hunting in the "Squire," tells us that a female kangaroo when hard pressed by the dogs, pulled her young one out of her pouch, dragged it in the path of her pursuers, and by thus sacrificing her offspring made good her own escape.

Dr. J. K. Kellogg ("Chicago Sanitary News") "can recommend tobacco to kill vermin of all kinds, except a kind of parasite that breeds in bar-rooms and billiard-halls, and may often be seen adhering to lamp-posts."

Beet-root sugar is now admitted to be distinct from cane-sugar. Its sweetening power is at least 30 per cent. lower, whilst its polarising power is greater. Hence, to sell beet-root sugar (betose) at the price of cane-sugar is a fraud.

March last has had at Brussels a mean temperature of only 1·9° C., as against an average of 5·3°. There have been 20 days of frost, the average number being only 8. ("Ciel et Terre.")

C. F. Krukenberg ("Verhand. Physik. Med. Gesell. Würzburg,") in a recent study of the colouring matter of egg-shells, confirms the existence of oorhodein, described by Mr. Sorby and Herr Liebermann. He gives to Sorby's oocyan the name of biliverdine, and the yellow and red ooxanthine of the same physicist he terms respectively oochlorine and ooxanthine. The other colours described by Mr. Sorby he has been unable to recognise. All flesh-olive or leather-coloured shells, and all which are spotted, sprinkled, or marbled with red, brown, or black, and all spotted or scribbled with ash-grey, contain oorhodein, rarely unmixed with oocyan. Oocyan is found in all green and blue egg-shells. Oorhodein is wanting in all the Cursores and in the Crypturidæ.

Dr. Monckton, lecturing on "The Human Will and its Correlatives," before the Maidstone Natural History and PhilosophicalSociety ("Light") asks, "Can mind-effort produce anything else than internal mental results without physical mediation? Can one mind act immediately on another mind? Can it affect another's bodily organisation? Can it operate on inanimate objects without physical intermediation?"

Are we to rest content with the mere defeat of the recent Anti-vivisection Bill? Will it not be well for persons introducing or supporting such Bills to find that in any future election the vote and influence of all medical and other scientific men will be arrayed against them, irrespective of party politics?

The "Medical Record" rightly pronounces the common saying that men die not of work but of worry a mere quibble.

Fruits ripened by the electric light are found to be deficient in flavour.

We regret to find that the so-called "Conservators" of Epping Forest are still proceeding with deep drainage and other operations calculated entirely to change the character of the place.

An evil-disposed boy at Brighton saturated the fur of a cat with petroleum and then set her on fire. For this piece of wanton cruelty he escaped with the moderate penalty of £3 12s. 6d. Had a physiologist inflicted one-tenth of this torment upon any animal, he would have been fined £50 besides being preached about, prayed at, caricatured in novels and poems, and perhaps pilloried upon some new "Peak of Darien."

M. Amans ("Comptes Rendus,") has been engaged with a series of researches on the wings of insects. To our no small disgust we find that his object is aërial navigation.

The University of Glasgow is again about to indulge in the election of a Lord Rector on political principles. It is time that this discreditable custom should be suppressed.

MM. Gaston Bonnier and L. Mangin ("Comptes Rendus") show that in fungi the volume of oxygen absorbed is greater than the volume of carbonic acid produced. The proportions in one and the same species do not vary with temperature. The intensity of respiration augments sensibly with the degree of atmospheric moisture. Respiration is diminished by diffused light, and is more intense under the blue and violet rays than under the red and yellow.

Dr. A. Mayer proposes the use of glass coffins, to be filled with carbonic acid gas, and hermetically closed! The great objections to this scheme are the expense and the withdrawal of so much combined nitrogen and phosphates from circulation.

We regret to find in the "Popular Science News," formerly known as the "Boston Journal of Chemistry," the following remarks concerning Pasteur:—"He is a steadfast believer in spiritualism (?), and takes no interest in evolution theories or positivist doctrines." Will it never become known that evolution and positivism are not merely unconnected, but mutually antagonistic?

According to M. Poincaré ("Comptes Rendus"), prolonged exposure to the vapours of creosote has a hardening effect upon the brain, the liver, and the kidneys. The lungs assume a faint grey colour, and the pulmonary cavities are effaced.

M. A. Lebedeff ("Neueste Erfindungen") has proved experimentally that foreign fats, taken as food, pass directly into the cellular tissues.

Law-makers have fixed a minimum age for marriage, going in some countries absurdly low. But why have they never laid down a maximum limit, and why do medical authorities condone the omission?

The U.S. surveying-steamer *Blake* has effected a sounding to the depth of 4561 fathoms, or above 5¼ miles, between Bermuda and the Bahamas, in lat. 19·41 N. and long. 66·24 W. The locality is not far from the deepest Atlantic soundings (3862 fathoms, or 4½ miles) of the *Challenger* expedition.

Prof. Lemström, of the Finland Meteorological Observatory, has obtained a direct proof of the electric nature of the aurora.

It is said that a Dr. Guidrah, of Victoria, has invented an instrument for conveying luminous action by electricity, so that a perfect picture of objects or events at distant places may be projected on a plate of metal. This invention, if it be as described, will be far more useful that the telephone.

M. J. Gazagnaire ("Comptes Rendus") investigates the importance of the zoological characters furnished by the labrum in the Syrphidæ. He concludes that its form has an absolute value for the family, whilst its modifications have a generic value for *Ceria*, *Humerus*, and *Volucella*.

According to M. Janson the optical characters of watery vapour in the atmosphere of Venus are very slight.

It appears that the great magnetic perturbation of November 17th was experienced at Cape Horn.

The "Medical Press and Circular" suggests that "whilst open drunkenness has diminished, secret indulgence in narcotics and sedatives has enormously increased."

MM. Prevost and Frutiger ("Comptes Rendus") have proved experimentally that in subacute poisoning with mercuric chloride there occurs calcification of the kidneys, parallel with the decalcification of the bones.

M. L. Jourdain ("Comptes Rendus") has studied the lymphatic system of tadpoles of frogs. He finds that their chyliferous system in the larval state is comparable to that of the adult Urodelæ.

M. A. Sanson ("Comptes Rendus") describes *avenine*, a stimulating principle present in oats and distinct from vanilline. It appears to act upon the motor cells of the nervous system.

M. Dieulafait, in a communication to the Academy of Sciences, signalises the close relation between zinc and magnesium, and shows that the former metal is always found in dolomites and other magnesian rocks. Magnesia is always accompanied by manganese.

A great quantity of pre-historical human skeletons, implements, &c., have been discovered at the southern extremity of Lake Ladoga.

According to Dr. Fessenger ("Bulletin Generale de Thérap.") ærobic vibrios can vegetate in phenic solutions, whilst the anærobic forms are absent.

A new journal is announced under the title of "Tabooed Topics," which, amongst other subjects, is to discuss vegetarianism, teetotalism, vaccination, and vivisection! We do not see in what sense the discussion of these topics has been "tabooed," and on one of them at least much more has already been said than is necessary or beneficial, save perhaps to professional agitators.

"Light" gives narratives of the appearances of the spirits of deceased cats, horses, and birds.

We regret to learn the sudden death of Prof. Zeller, editor of the "Stettiner Entomologische Zeitung," and acknowledged for many years as the *facile princeps* of modern Micro-Lepidopterists. His first paper appeared in 1838 in Oken's "Isis," and stamped him at once as equally acute and thorough in observation and clear and accurate in description.

According to M. Ball ("Revue Scientifique") original thought borders closely upon insanity.

Dr. C. A. Cameron ("Medical Press"), in a memoir read before the Public Health Section of the Academy of Medicine in Ireland, pays a tribute to Southwood Smith, Andrew Combe, and Chadwick, but by some accident overlooks the true father of Sanitary Reform, Dr. G. Walker.

It is sad to learn that an eminent medical practitioner, formally commissioned by the Society for the Advancement of Medicine to examine the parasitic theory of phthisis, is obliged to proceed to Toulouse and Berlin in order to conduct his investigations, owing to the interference of the Anti-Vivisection Act.